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UNCLE SAM'S PANAMA CANAL AND WORLD HISTORY

ITS ACHIEVEMENT AN HONOR
TO THE UNITED STATES
AND A BLESSING TO THE WORLD

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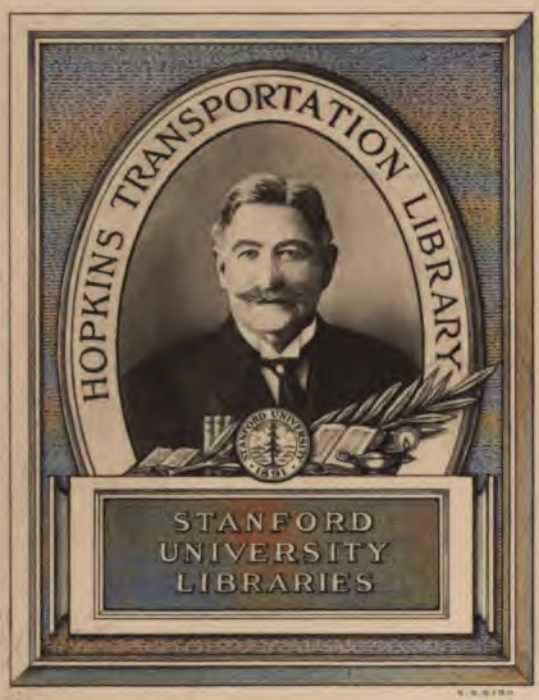

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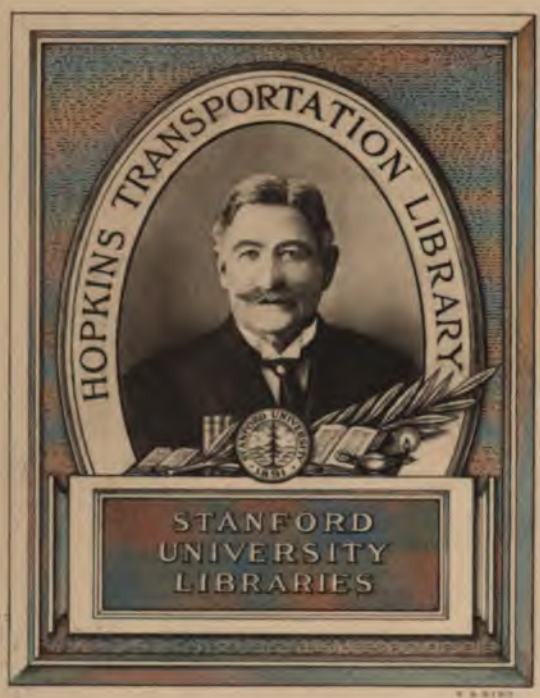

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COL. GEORGE W. GOETHALS, U. S. A.
CHAIRMAN AND CHIEF ENGINEER OF THE ISTHMIAN CANAL COMMISSION

UNCLE SAM'S

Panama Canal *and* World History

ACCOMPANYING THE PANAMA CANAL FLAT-GLOBE

ITS ACHIEVEMENT AN HONOR TO THE UNITED STATES AND A BLESSING TO THE WORLD

By

JOSEPH BUCKLIN BISHOP

Secretary of the Isthmian Canal Commission

and

ADMIRAL ROBERT E. PEARY, U. S. N.

ILLUSTRATED

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WE STATE WITH SATISFACTION that the Panama Canal Flat-Globe and Geographical World History give in a concise, yet exhaustive form, an up-to-date presentation of world-wide geography that has no counterpart. They also comprise a new and advanced system of geographical review and reference that has never existed before, in a form that is easy to understand and convenient to use. Further, they give a full illustration and description of the Panama Canal, and the facts about the Suez Canal by the highest authority.

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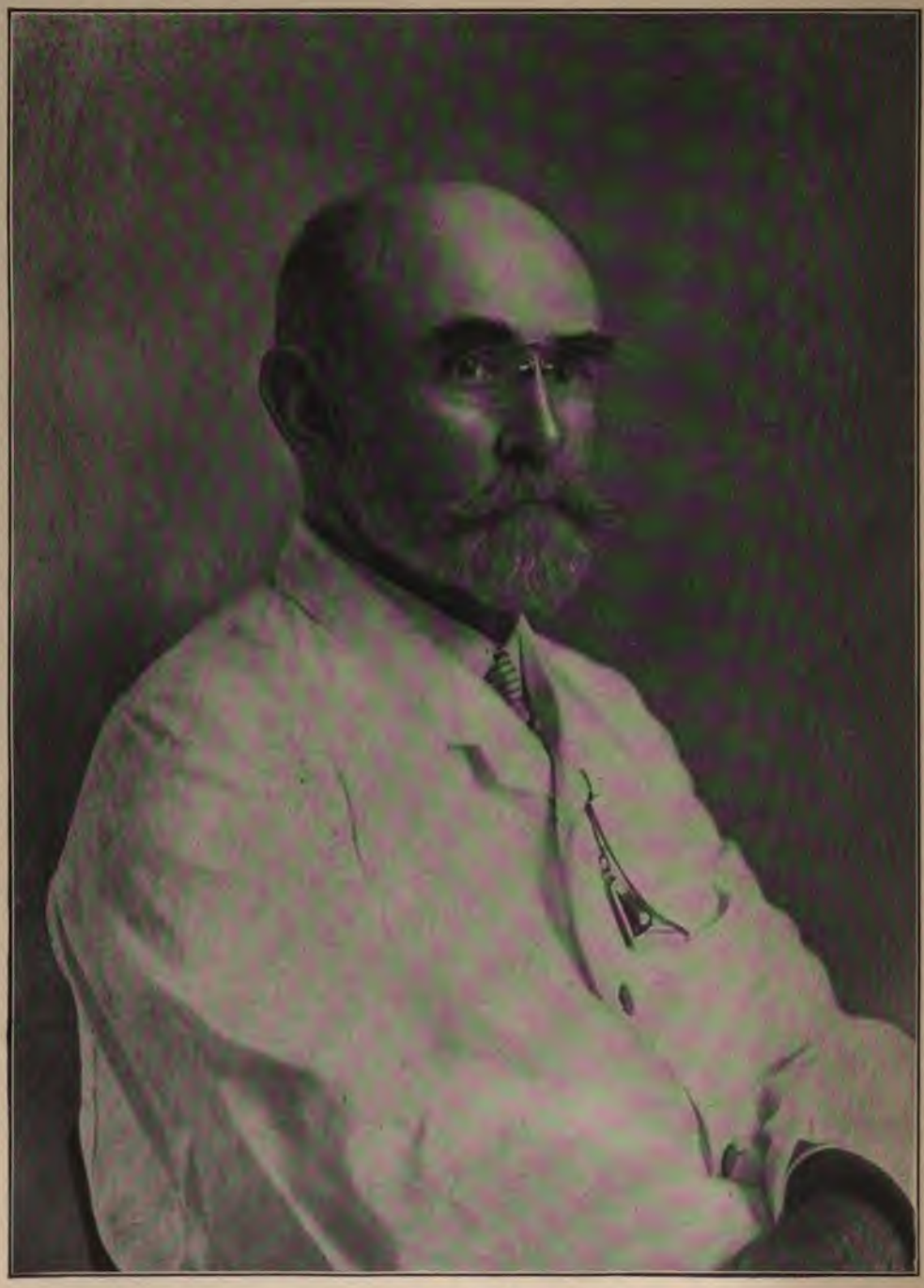
It is not heavy, cumbersome, inconvenient to use, nor does it occupy a large space in the office or home. It can be used upon a table or desk, upon the lap, or at night under a light.

In traveling it can be carried in a valise or trunk always ready for use, occupying almost no space.



JOSEPH BUCKLIN BISHOP
SECRETARY OF THE ISTHMIAN CANAL COMMISSION

UNCLE SAM'S
PANAMA CANAL and WORLD HISTORY

THE official seal of the Isthmian Canal Commission bears the motto: "The Land Divided. The World United." That is a terse and accurate statement of what the Panama Canal accomplishes. It divides a hemisphere and by opening a new and shorter ocean highway brings the nations of the earth into closer intercourse with one another.

In supplying this highway the United States has conferred a benefit upon mankind which has few equals in human history, the full measure of which time alone can reveal.

Great wars change the map of the world by their victories, but few have made more radical and far reaching changes than will follow this momentous victory of peace—a victory for human welfare and progress.

The Vision of Columbus.—The Canal realizes the dream of Columbus in supplying by the hand of man that "hidden strait" which he sought so eagerly in the firm belief that it had been created by the Almighty as the pathway of the seas to the Indies. If he were living to-day and could visit the Atlantic entrance to the Canal he would find it placed in an inlet of the same shore which he scanned so closely nearly four centuries ago as he sailed along it in his search for the "hidden strait."

Balboa and Magellan.—His belief remained unshaken for many years after his death, and the search was continued by navigators from various nations of the old world who had been inspired by his discoveries to follow in his wake.

Even after Balboa had climbed the mountains of the Cordilleras and caught his first glimpse of the Pacific Ocean, it still maintained its hold. The realization of the fact that Columbus

as Pedrarias, one of the most unscrupulous and cruel of the many adventurers who were sent out by Spain to rule its new possessions in America. He was jealous of Balboa's great fame as a discoverer and of his popularity in the province in which both lived. He had Balboa arrested and tried on trumped-up charges and beheaded together with four of his companions, two of whom had stood with him on the mountain when he first saw the Pacific ocean.

The name of the place at which the execution took place was Acla, meaning bones, so called because it was the frequent battle ground of two rival Indian tribes whose chiefs were two brothers. It was a small settlement of huts, situated on the northeastern shore of the Gulf of Darien, and it was from it that Balboa set out to cross the mountains on his journey of discovery.

Old Panama.—Avila's murder of Balboa, and his many other atrocities, compelled him to flee from the province on the coast of the Gulf of Darien of which he was the ruler by order of the King of Spain. A few months after Balboa's death, he started with about 400 followers, crossed the mountains over the same route in which Balboa had travelled, passed down the Gulf of San Miguel to the Pacific, and there embarked in some ships Balboa had constructed for voyages of discovery, and sailed along the coast to the eastward.

He passed the Pearl Islands in the present Bay of Panama, which Balboa had discovered and named, passed also other groups of islands, three of which are now the sites of the fortifications of the Canal at its Pacific entrance, and reached a small Indian village about four miles east of the present city of Panama.

Panama Means "Plenty of Fish."—The village stood at the head of a deep and shallow bay, which was quite dry at low tide. It was a mere settlement of huts, the inhabitants being fishermen who called the place Panama because of the abundance

of fish in the waters, the word signifying in the primitive language of the native Cueva Indians "plenty fish."

Founding the City.—Avila decided to found a city there, and it was established formally with the name of Panama on August 15, 1521. Gradually the inhabitants of the settlement on the Gulf of Darien, the chief of which was Santa Maria de la Antigua, with their flocks and other possessions, moved to the new place.

It grew rapidly, and was made a city by royal decree of Charles V, on September 15, 1521. Its position as the chief port of the Pacific and terminus of the first transit route or trail across the Isthmus was the chief cause of this. It was the gateway for all commerce between Spain and its American possessions, including the great output of gold and silver from the rich mines of Peru. Pizarro fitted out there his three expeditions to Peru, the last of which resulted in its conquest in 1531.

It was twice swept by fire, first in 1563, and again in 1644, being nearly destroyed on both occasions. It rallied from the latter disaster only to be sacked in 1671 by Morgan, the notorious buccaneer, and burned to the ground.

The City's Size and Wealth Exaggerated.—History for nearly two centuries has abounded in exaggerated statements concerning the size and wealth of the city. These are founded on the celebrated narrative of John Esquemeling, one of Morgan's band of pirates who sacked the city.

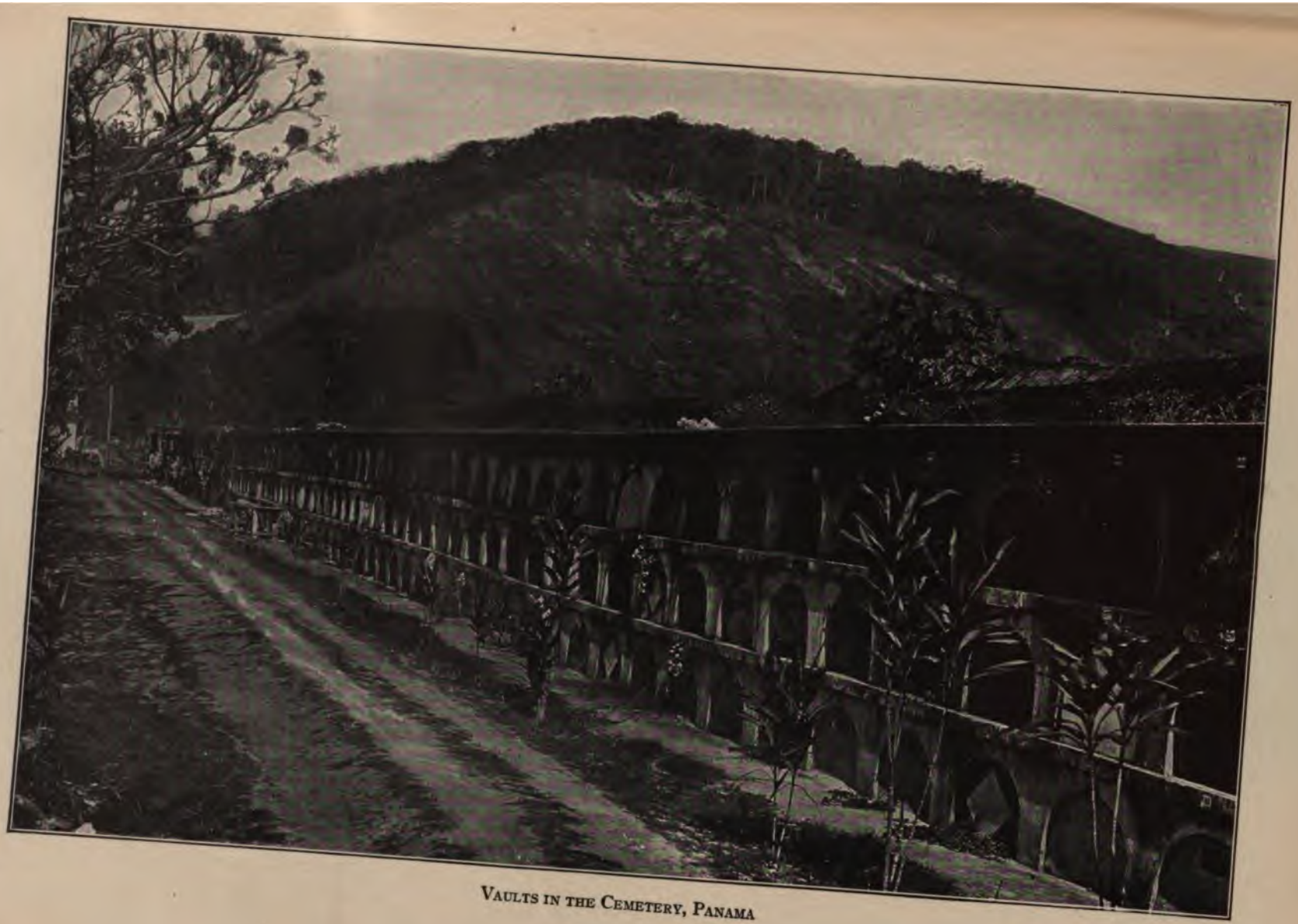
Esquemeling's book, which was first published in Holland in 1678, and has had repeated publications in English since that time, retains its position to this day as one of the most vivid and interesting books in piratical literature, but as history it is absurdly inaccurate. In it he represented the city as containing "two thousand houses of magnificent and prodigious building, being all or in the greatest part inhabited by merchants of that country who are vastly rich," for "inhabitants of lesser quality

and tradesmen five thousand houses more," and eight monasteries and two stately churches, "all richly adorned with altar pieces and paintings."

Real Size of the City.—On this foundation, imaginative writers have constructed a city of 50,000 inhabitants, vast wealth and magnificent buildings. The facts of the case, revealed by careful study of the dimensions of the site, the character of the ruins, and the official documents relating to it in the archives preserved by the government in Spain, show that its area never exceeded 150 acres, that outside of its churches and monasteries and a few public buildings, it contained no structures that could be called magnificent or anything approaching that term, and that its population never exceeded 10,000, the greater part of whom were negroes and slaves. Its buildings, aside from those mentioned above which were of stone, were similar to those in Central American towns of to-day, simple in character, and mainly of wood, while those of the negro population were rude huts or shacks. It was a mere gateway for the wealth which passed through it to Spain.

The New City of Panama.—So complete was the destruction of the old city that no effort was made to rebuild it. Its surviving inhabitants sought for a new city a site which could be fortified on all sides, that is, a site for a walled town. This they found about four miles west of the old site, at the head of the Bay of Panama.

There in January 1673, they established by royal decree and with formal religious ceremonies the present city of Panama. They surrounded it with a huge wall, varying from 20 to 30 feet in height, in some places 60 feet in thickness, and about four miles in length. There were strong forts on the land and sea sides, with the heaviest fortifications known at the time, and on the land side a deep moat with drawbridge and massive gates.



VAULTS IN THE CEMETERY, PANAMA

The wall was many years in building, and cost large sums of money. Into its construction went much stone brought from the ruins of the monasteries and churches of the old city. It was designed to repel assault by land and sea and was entirely successful. Sections of the old wall exist to-day, but the greater part of it has disappeared as the city has increased in area.

The Famous Flat Arch.—Its cathedral was nearly 88 years in building, and is in good condition to-day. Some of its earlier churches are now in ruins. In one of these, which was nearly destroyed by fire in 1756, was the famous "flat arch," recently removed, which was an object of great interest to visitors because of its unusual construction. It was shown to visitors and cited as evidence of the lack of severe earthquakes on that part of the Isthmus for the past two centuries.

Mule Trail Transit.—In 1519, the first line of posts with a connecting trail was opened across the Isthmus from the Atlantic to the Pacific. It ran from old Panama city on the Pacific to Nombre de Dios on the Caribbean, a distance of about 90 miles, crossing the Chagres at a place called Venta Cruz, afterward Cruces. For 16 years this was the sole transit route. Later the Chagres River was made navigable for small boats from its mouth in the Caribbean to Venta Cruz, a distance of about 36 miles, and thus opened a water route from Venta Cruz to Nombre de Dios, which was situated about 35 miles east of the present city of Colon.

In 1597, Porto Bello, 15 miles east of Colon, was substituted for Nombre de Dios. This town was situated in a bay which had been visited and given that name by Columbus in 1502. It was taken and sacked by Morgan in 1668.

The American canal builders, in search of suitable sand and clay for the construction of the Gatun locks found the former at Nombre de Dios and the latter at Porto Bello.

SOME PANAMANIAN BELLES IN NATIONAL COSTUME

Three Centuries of Mule Transit.—Transit by rudely paved trails and small craft over the lower portion of the Chagres River continued to be the sole method of crossing the Isthmus for nearly two and three-quarter centuries.

An irresistible demand for better facilities arose in 1848 when the discovery of gold in California sent thousands of eager fortune seekers across the Isthmus for that state. Unwilling to submit to the delay of the long journey around Cape Horn, they took the short cut of the Isthmus, carried to it by packet and steamship lines which were opened between New York and the termini of the Isthmus trails on the Caribbean.

The hardships which they endured aroused public attention in the United States to both the necessity and the commercial value of a more satisfactory method of transit.

The Panama Railroad.—In December 1848, three energetic and far-sighted citizens of New York, William Henry Aspinwall, John Lloyd Stephens and Henry Chauncey, under the name of the Panama Railroad Company, obtained from New Granada of which Panama was then a part, a grant for the construction of a railway across the Isthmus. In the following year the New York Legislature passed an act incorporating the company. Construction of the road began in 1850 and it was completed in 1855. The chief engineers in charge of the work were Col. George M. Totten and John C. Trautwine. The first continued till the end, but the second retired at the end of the first year.

Real Pioneers of the Canal.—There is not in the annals of railway construction anywhere record of greater persistence and more indomitable courage than the builders of this railway showed.

They were the pioneers of the canal, and the hardships which they endured were far beyond any that the canal builders had to face. The road which they built pointed the way for the

canal of the future and became the chief agency in its construction.

They did honor to the American name and deserve to be held in lasting remembrance, yet so quickly are great deeds forgotten that to-day their names are virtually unknown and among thousands of Americans there exists a belief that the Panama Railroad was constructed by the French during their effort to build a canal, though it was finished more than a quarter of a century before they arrived on the Isthmus.

Cost in Money and Life.—The cost of the railway in money was about $8,000,000. The cost in life has been grossly exaggerated.

A deathless "fake," which has been published seriously many times, says it "cost a life for every tie." That has a taking sound and is easily remembered and though often denied has a fair chance of immortality.

Its absurdity is shown by the fact that there were about 150-000 ties in the railway, whereas the total force employed in its construction did not exceed 6,000. Col. Totten placed the death roll at 835, including 295 white laborers; 140 black; and 400 Chinese.

The Clayton-Bulwer Blockade.—At the same time that the three American pioneers were beginning the construction of the Panama Railroad, there was in contemplation the building of a canal. In 1850 the United States and Great Britain formed what is known as the Clayton-Bulwer treaty in which they agreed to favor the construction of an Isthmus Canal under their joint protection. The object of this was to hasten the building of a canal, but the joint protection provision was so unpopular in the United States that it made impossible any such construction for 50 years.

The French Failure.—In the meantime, Count Ferdinand

de Lesseps, the builder of the Suez Canal, conceived the idea of repeating his success at Panama. He formed a company for that purpose in 1879 and began work in the following year. He proposed to build a canal at sea level and to accomplish the task in 12 years, at an estimated cost of about $132,000,000. Eight years were spent in the effort, and about $260,000,000 were expended. During that time about one-third of the proposed canal had been excavated. A change was made to a lock canal during the final year, but only a small amount of work was done upon it.

Collapse of the Company.—The failure of the French Company in 1889 was complete. It had received from all sources $266,000,000, and every cent of it had been spent. It was placed in the hands of a receiver and an official examination of its affairs which followed revealed a vast amount of extravagance and bad management.

Count de Lesseps and his son Charles were sentenced to a fine and to a term of imprisonment, and similar sentences were passed upon several of their associates. The sentence against the Count was never executed for he was 88 years old at the time, and in very feeble health. He died about a year later. That against his son was annuled by the Court of Appeals.

Work of the French.—It is the undivided opinion of the engineers of the American canal that the French engineers are entitled to high praise for their excellent work, and for the courage and devotion shown in prosecuting it. They had to encounter obstacles which their successors were not called upon to meet. The mosquito theory of disease transmission—which will be considered later on in this narrative—was unknown to them. They did not know that both malaria and yellow fever were transmitted in that way and in that way alone, and could not adopt effective measures of prevention.

STREET VENDERS, A COMMON SCENE IN PANAMA CANAL ZONE

The consequence was that their death roll, from yellow fever especially, was very heavy, and dread of that mysterious disease was constant and demoralizing. During the eight years of work about 2,000 Frenchmen died of yellow fever, and the total death roll from all causes among all employes is estimated by the best authorities at about 16,500.

It was a situation to try men's souls, and it is an honor to the French nation that its sons proved nobly equal to the test.

Enter the Americans.—Following the French failure, events which were to clear the way for the American canal occurred with gratifying rapidity. A new treaty with England, known as the Hay-Pauncefote treaty, was adopted which gave the United States the right to construct what the American people desired—an American canal, built by Americans and controlled by Americans.

A Commission appointed by President McKinley in 1890 had made a report in favor of constructing an Isthmian canal at Nicaragua in preference to Panama because the new French Canal Company which had been organized on the ruins of the old asked $109,000,000 for its rights, property and franchise on the Isthmus, which the Commission had valued at $40,000,000.

Before action could be taken by Congress, the French Company consented to sell for $40,000,000, and the Commission reversed its finding and recommended a canal at Panama.

In June, 1902 a bill was passed by both houses of Congress and signed by President Roosevelt adopting Panama as the route.

A Good Bargain.—That the United States made a good bargain in this purchase has been established beyond dispute. A careful appraisal was made and officially adopted by the Canal Commission which has built the canal, soon after the work was well under way, of the value of the work done and property of

all kinds received from the French in return for the payment, and the total was fixed at $42,799,826. Of this amount about $25,000,000 was for that part of the French excavation—39,000,000 cubic yards out of a total of 78,000,000—which had proved useful to the American Canal.

Colombia Loses Panama.—Before work could begin at Panama a treaty had to be made by the United States with Colombia. One was negotiated, was signed by representatives of both countries, was ratified by the Senate of the United States, but was rejected unanimously by the Congress of Colombia, on the ground that the price stipulated to be paid to Colombia, $10,000,000 in gold and, in addition, beginning nine years after the date of ratification, an annual payment of $250,000, was insufficient.

The authorized representative of the Colombian government had informed the American government through its minister at Bogota that the treaty could not be ratified without two amendments, one stipulating that the French Canal Company should pay to Colombia $10,000,000 for the right of transfer of its Isthmus property to the United States and the other increasing the payment of the United States to Colombia from $10,000,000 to $15,000,000. Secretary Hay, for the United States government, refused to entertain these proposals.

Panama Revolts.—The representatives of the department or province of Panama in the Colombian Congress gave public notice while the treaty was under consideration that Panama would revolt if it were rejected. It was rejected on August, 12, 1903, and on November 3 a revolution took place in Panama and an independent Republic was established. The United States government promptly recognized the new republic, negotiated a treaty with it for the construction of a canal, and in May 1904, formally took over its acquired property and began work.

Terms of the Treaty.—Under the provisions of the treaty the United States guarantees and will maintain the independence of the Republic of Panama. In return for the payment of $10,000,000 made on the date of the exchange of ratifications, and for an annual payment of $250,000 beginning nine years after that date, the Republic of Panama grants in perpetuity to the United States a strip of territory ten miles wide and extending three marine miles into the sea at either terminal, for use, occupation and control, together with all lands lying outside this zone which are necessary for the construction of the canal or for its auxiliaries, and the islands of Perico, Naos, Culebra and Flamenco in the Bay of Panama.

The cities of Colon and Panama are not embraced in the zone, but the United States assumes their sanitation and, in case of need, the maintenance of public order therein. Within the zone the United States has all the rights, power, and authority which it would possess and exercise were it the sovereign of the territory, to the entire exclusion of the exercise of sovereign rights by the Republic of Panama.

All railway and property rights possessed by Panama pass to the United States. The right is granted to the United States to use its police and military forces and to build fortifications at its discretion and at all times for the protection of the canal.

In many of its details the treaty follows the stipulations of the rejected Colombian treaty, but it differs from that in granting to the United States absolute sovereignty in the Canal Zone, a power that has been of incalculable advantage in constructing the canal.

The Yellow Fever Mosquito.—Before the Americans could begin work the Isthmus had to be thoroughly cleaned up, made a healthful place of abode. In this task the great discoveries that were made by a board of U. S. army surgeons in

GATHERING BANANAS IN PANAMA

Havana, in 1900, proving that yellow fever was transmitted from one person to another by mosquitoes and in no other way, were of the first value.

There were four of these surgeons, one of whom was immune and took no part in the tests which resulted in the discovery. The other three—Walter Reed, James Carroll and Jesse W. Lazear—conducted the experiments.

Carroll and Lazear permitted themselves to be bitten by infected mosquitoes.

Both caught the disease. Carroll recovered, but Lazear died—a martyr to science and to the human race.

The story of the heroism displayed by these surgeons and by American soldiers who offered themselves for the tests is too long to be told here. It is to be found in various publications and should be read by everyone who admires courage of the highest order and unselfish devotion to duty. It is one of the most inspiring in human history.

The Malarial Mosquito.—A similar discovery—that malaria is transmitted by another type of mosquito, and in no other way—had been made in 1898 by Major Ronald Ross, a surgeon of the British army in India.

In Cuba and Egypt.—Both these mosquito theories had been applied in Havana in 1901 and had been completely successful in suppressing yellow fever and in greatly reducing the number of cases of malaria. The malarial theory also had been applied about the same time along the line of the Suez canal in Egypt with completely successful results.

Yellow Fever Banished.—In January 1905, the second year of American occupation, there occurred an outbreak of yellow fever on the Isthmus which lasted for the entire year and resulted in the death of 35 Americans. It was suppressed by the application of the methods prescribed by the discoverers of the theory

MAIN STREET, CULEBRA, BEFORE AMERICAN OCCUPATION

—that is, vigorous warfare on mosquitoes and complete segregation of the victims. Since then there has been no case originating on the Isthmus.

There can be no new case of yellow fever unless there be a victim of the disease for the mosquito to bite.

Without a victim the mosquito has nothing to carry and is thrown out of business.

Malaria Restricted.—With malaria the case is different. The victim of yellow fever dies or gets well and ceases to be a source of germ supply. The victim of malaria carries the germs in his system for years and is a continual source of supply.

It is thus virtually impossible to banish malaria, but it can be restricted by the use of screens for houses and by large doses of quinine. This has been done in the Canal Zone with the result of reducing the number of cases one-third.

During six years the Sanitary Department of the Canal Commission distributed free among its employes 15,600 pounds avoirdupois of quinine, 109,200,000 grains, an average of 2,600 pounds, 18,200,000 grains a year.

A Healthful Canal Zone.—The cost of making the part of the Isthmus occupied by Americans healthful has been very great. The work included not only mosquito warfare but all activities in the interest of public health—hospitals, quarantine, street-cleaning, garbage collection, water-supply, sewer construction and street paving. The average annual outlay for all these purposes during the period of canal construction has been about $1,900,000, and the total outlay, when the canal is completed, will be about $20,000,000. For sanitation proper the total outlay will be about $6,000,000.

A Wise Expenditure.—That it was a wise as well as a necessary expenditure, cannot be questioned. Without it the

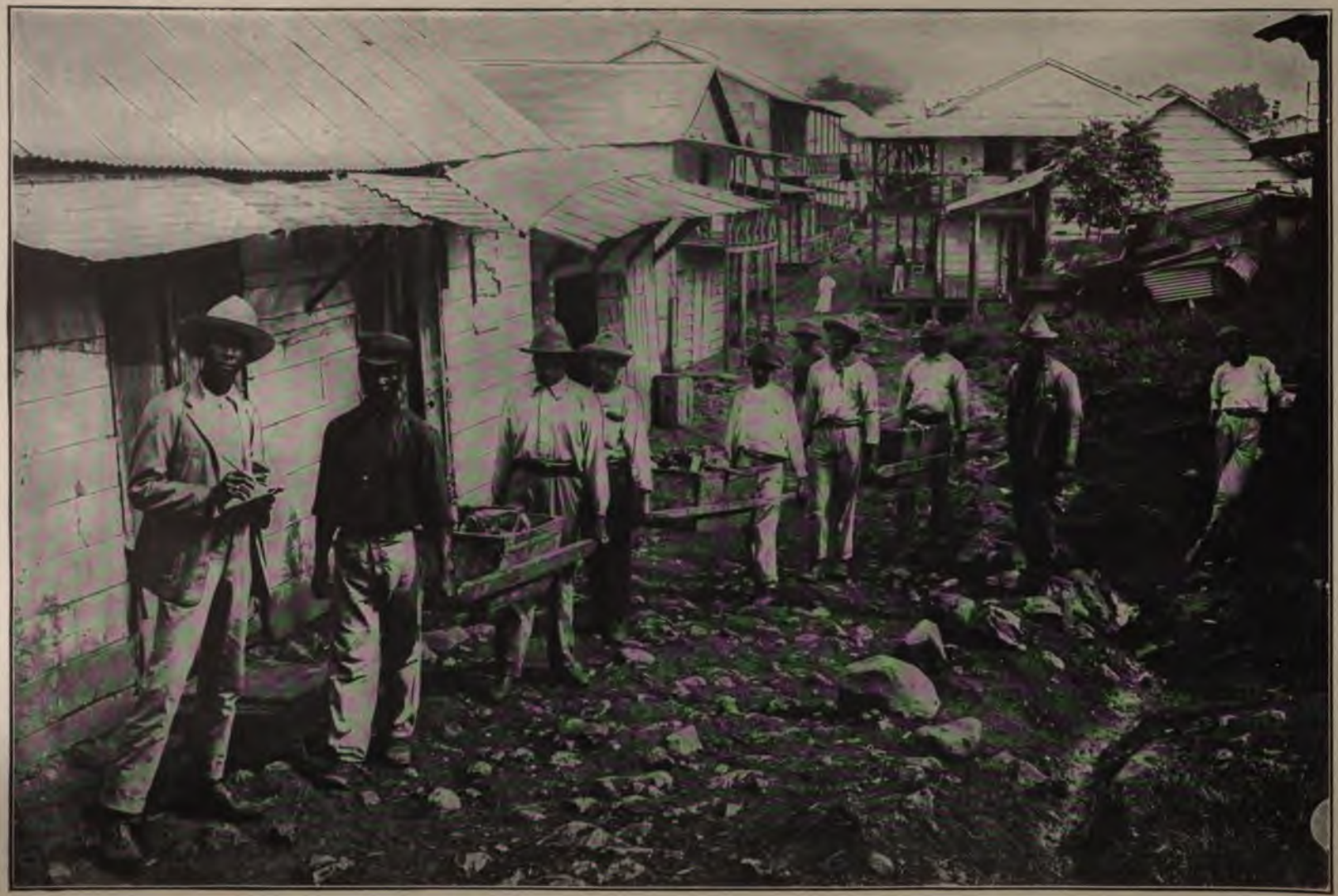
canal could not have been built for a working force could not have been retained on the job.

A Tropical American State.—What the American canal builders had to do on the Isthmus was to create a North American state in the heart of a Central American Republic. They had not only to make the Canal Zone healthful, but to build dwellings for the canal forces, provide a food supply, and create a form of government, with school, court and police systems. Before work could be begun they had to assemble a working force, collect an operating plant and establish great machine shops to put the huge machinery of the plant together and keep it in repair.

A Colossal Task.—This was a new field of labor for American effort and energy and of really colossal proportions. Within three years it was accomplished and at the end of that period the work of active canal construction began with full vigor.

Labor and Equipment.—A working force of about 40,000 men was assembled, and lodged in excellent quarters. A food and other necessary supply system was in working order which provided easily and satisfactorily for the wants of 60,000 persons a day. An operating plant was assembled which was without parallel in dimensions and efficiency in similar work anywhere in the world.

The Starting Point.—January 1907 was the starting point for grand assault on the actual task of canal construction. A lock canal, rather than one at sea level, had been decreed by Congress, two Commissions in succession, each with its own chief engineer, had grappled successfully with the problems of preparation, and a third Commission, composed mainly of trained engineers of the Army and Navy, was about to take charge of the great task of construction, under the leadership, as Chairman and Chief Engineer, of one of its members, Col. George W. Goe-



Cleaning Up Culebra After American Occupation

thals, who was destined to demonstrate his pre-eminent fitness for the position.

A Geat Task.—Time was to prove that the task in hand was far more difficult than the best expert engineering, both of the United States and of Europe, had anticipated.

Physical Layout.—The line of the canal across the Isthmus runs through low lying land from the Atlantic for a distance of about 30 miles when it strikes the foothills of the mountains of the Continental Divide. The foothills and mountains cover a distance of nearly 9 miles. After passing this obstruction the canal line runs through low lying land to the Pacific.

Chagres Valley.—From the mountains and foothills of the Divide, there stretches away toward the Atlantic on either side of a broad valley a line of hills. These hills approach each other as they near the Atlantic till they are within a mile and a half of each other at Gatun. The valley lies between the mountains and the hills in the shape of a horse shoe with its opening toward the Atlantic.

The Gatun Dam.—Into this valley the Chagres River and several other streams pour their waters. The canal plan places a great dam at the opening of the horse shoe and impounds all these waters, making a huge reservoir covering 164 square miles. When full, the level of this lake is 87 feet above the mean level of the sea.

Improving Nature.—If nature had intended to make a mountain lake on this part of the Isthmus, like the lakes among many other mountains of the world, she would have brought the lines of encircling hills together at this point and the thing would have been done, and the work of the canal builders would have been greatly simplified. They would have been required only to cut a passage through the Divide.

Making the Lake.—What they had to do was to cut a

passage through the Divide and transport the material removed thirty miles and make a dam out of it for the closing of the valley.

The most eminent engineers of the world estimated that the amount of excavation required for this work would be about 104,000,000 cubic yards. The actual amount has been nearly or quite double that.

The same expert authorities estimated the amount of excavation due to slides or breaks in the cut through the mountain range at 500,000 cubic yards. It exceeds 25,000,000.

Work and Cost.—Behold an object lesson in honest, intelligent and efficient management!

In October 1908, the Canal Commission adopted $375,000,000 as its estimate of the final cost of the canal, including the payment of $40,000,000 to the French Company, $10,000,000 to the Panama Republic for the Canal Zone, and $8,000,000 of loans to the Panama Railway Company for construction of a new line.

Since that time, the amount of excavation upon which that estimate was based has been increased by slides and other causes at least one-third—over 33,000,000 cubic yards—yet the canal has been completed more than a year ahead of time and several million dollars of the sum estimated will be turned back into the U. S. treasury or used for the fortifications of the canal.

Is there a parallel for this achievement in any great public work in this or any other country?

And not a suspicion of "graft" has attended the work from its beginning to the end!

A Great Water Bridge.—The canal itself is unlike any other in the world. It is in reality a great bridge of water, 87 feet above the level of the sea, extending nearly the entire width of the Isthmus. Gatun Lake constitutes the larger part of it.

To reach the surface of the lake, vessels must be lifted 87

CULEBRA CUT, AT ITS DEEPEST POINT, EXCAVATION NEARLY COMPLETED

feet and this is done by means of locks, the largest ever built. There are three pairs of these, on each side of the Isthmus, making 12 in all, and their combined lift is 87 feet.

On the Atlantic side the three pairs are in series, like a flight of steps, and vessels pass from one directly to another.

On the Pacific side there are two pairs at one point and one at another, with a small lake, about a mile in length between them.

Size of Gatun Dam.—The water of the Gatun Lake is held in place by the Gatun Dam, which is about a mile and a half long, measured on its crest, a half mile wide at its base, and 105 feet high.

It contains 21,000,000 cubic yards of material, half mingled earth and rock brought from Culebra Cut, and half an impermeable mixture of sand and clay pumped into it by hydraulic dredges. This latter material forms the core of the dam.

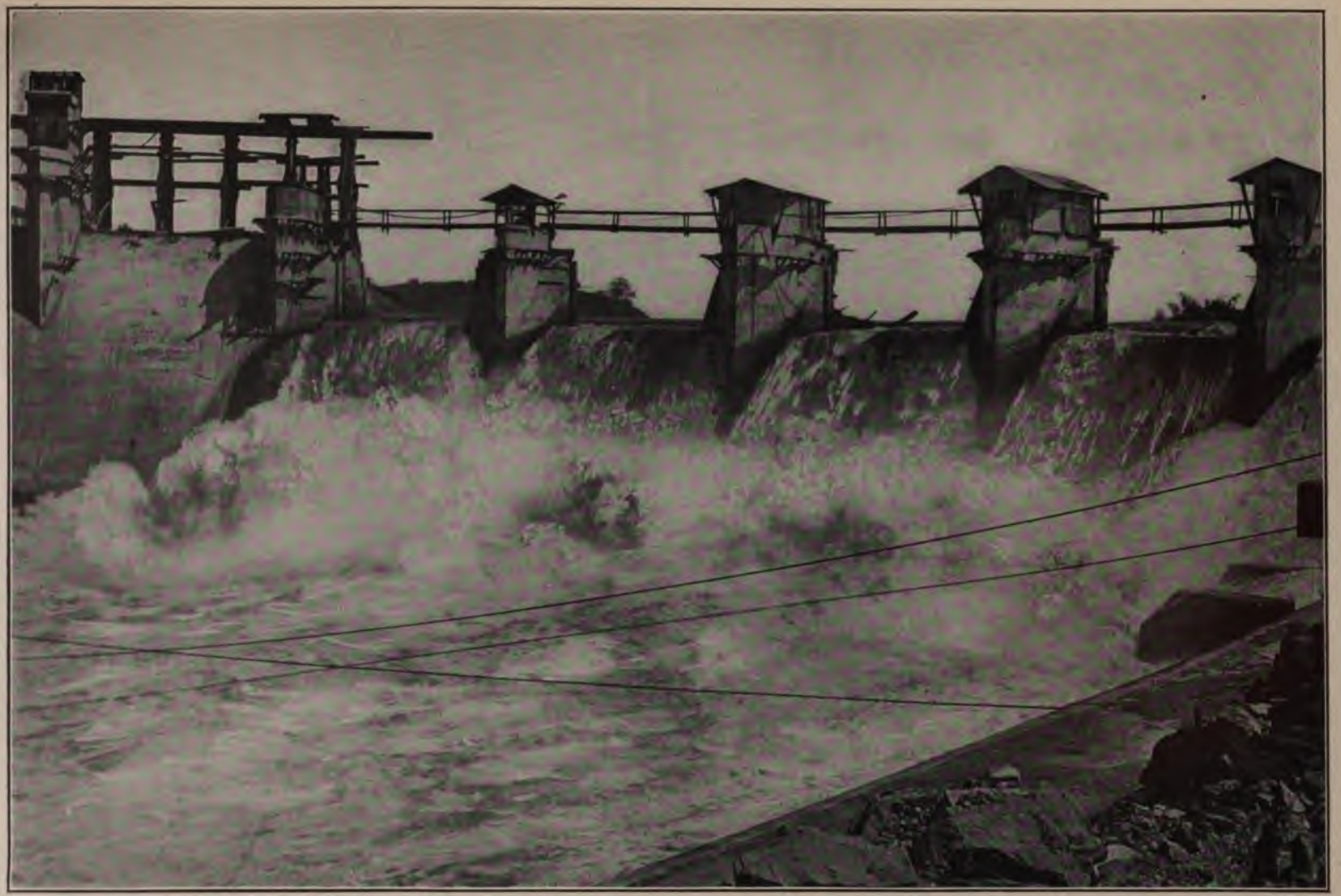
The Spillway.—The spillway of the dam is a concrete-lined passage 285 feet wide and 1200 feet long which has been constructed through a hill of rock which stands nearly in the center of the dam.

At its entrance from the lake a concrete dam in the form of the arc of a circle has been erected, and on the top of this gates are placed for regulating the level of water in the lake.

The spillway and the lock gates are in reality portions of the dam in that they hold back the water to its maximum level of 87 feet.

When the water reaches a level above 87 feet the gates are opened and the surplus water runs off.

Electricity for the Canal.—Connected with the spillway is a hydroelectric plant, operated by water from the lake and capable of generating sufficient electricity to operate all the locks and other machinery of the canal, light the canal and Canal Zone villages, and operate and light the Panama Railroad.



THE SPILLWAY DISCHARGING 15,000 CUBIC FEET PER SECOND

Culebra Cut.—Culebra Cut, which is the name of the passage through the mountain range, is an arm of Gatun Lake. It is nearly 9 miles long, its channel has a bottom width of 300 feet, and in making it 100,000,000 cubic yards of earth and rock have been removed, or nearly double the original estimate.

It has a depth of 45 feet of water throughout, and its water level is that of Gatun Lake. It extends from Bas Obispo, at the southern extremity of Gatun Lake and the valley of the Chagres, to Pedro Miguel where the first pair of locks on the Pacific side are placed.

Length of Water Bridge.—The water bridge, therefore, reaches from the Gatun dam, through the Culebra Cut to Pedro Miguel, a distance of about 34 miles. The lock gates and small dams on either side correspond to the dam, spillway and gates at Gatun in holding the waters of Gatun Lake in place.

Depth of Water.—The width of the channel in the water bridge varies from 1,000 feet in the larger portion of the Gatun Lake to 300 feet in Culebra Cut. It is nowhere less than 300 feet. The depth of water in the channel varies from 87 feet in the lake to 45 feet in Culebra Cut.

There are approach channels in both oceans, each 500 feet wide and 45 feet deep, extending from deep water in the ocean to Gatun locks on the Atlantic side and to Miraflores locks on the Pacific side.

Line of the Canal.—By consulting the accompanying map it will be seen that the line of the canal does not run east and west, as is quite generally supposed, but from northwest to southeast. The Pacific entrance is 22½ miles east of that on the Atlantic.

Length of the Canal.—The entire length of the canal from deep water in the Atlantic to deep water in the Pacific is about 50 miles—from shore-line to shore-line, about 40 miles.

CANAL CHANNEL, 800 FEET WIDE, IN SOUTHERN PORTION OF GATUN LAKE

Locks and Lock Walls.—The locks are the largest in the world, and are all of the same useable dimensions—1000 feet long and 110 feet wide. They can accommodate easily the largest ships yet constructed. Their walls are of massive concrete, from 45 to 60 feet wide at the base and reaching to a height of 81 feet. They contain about 5,000,000 cubic yards of concrete.

Lock Gates.—The lock gates are steel structures seven feet thick, 65 feet long, and from 47 to 82 feet high. They weigh from 390 to 730 tons each. Ninety-two leaves are required for the entire canal, the total weighing 60,000 tons.

The leaves are shells of structural steel covered with a sheathing of steel riveted to the girder framework. Each leaf is divided horizontally into two separate compartments. The lower compartment is watertight, for the purpose of making the leaf so buoyant that it will practically float in the water and thus largely relieve the stress upon the bearings by which it is hinged to the wall.

This watertight compartment is subdivided vertically into three sections, each independently watertight so that if the shell should be broken in any way or begin to leak, only one section would probably be affected.

An air shaft 26 inches in diameter runs from the bottom compartment up to the top of the gate, and this also is watertight where it passes through the upper half of the leaf.

Intermediate gates are used in all except one pair of the locks, in order to save water and time; if desired, in locking small vessels through, the gates being so placed as to divide the locks into chambers 600 and 400 feet long, respectively.

Ninety-five per cent. of the vessels navigating the high seas are less than 600 feet long.

Passage of the Canal.—The best way in which to get a cor-

rect conception of the canal as a whole is to accompany a vessel from ocean to ocean as it passes through it.

Starting four miles at sea in the Atlantic, a vessel enters the approach channel and passing by the city of Colon advances to the lower lock at Gatun, the water in which is on a level with that of the sea and 45 feet in depth.

Before entering the lock the vessel is tied up to a long wall or pier which extends into the channel between the two sets of locks for a distance of about 1,000 feet.

Here it is turned over to the canal operators who take complete charge of it and are responsible for it during its passage through the locks. They place a representative of their own on the bridge and another in the engine room.

The worst accidents which have occurred to vessels in locks have been caused by an engineer mistaking a signal from the bridge and going ahead when he should have gone backward, thus ramming and breaking a lock gate.

No Accident Possible.—This is not possible at Panama. No vessel is allowed to pass through the locks under its own power.

Vessels are taken through by electric locomotives running in cogged tracks on the approach and lock walls.

Every movement of the ship is made in full view of those who are in control of it.

Safety Chain Device.—Before the vessel in tow can enter the first lock it must pass a great chain stretched across the channel. If all is going well, the chain is dropped into a groove in the concrete floor of the channel, and the vessel enters the lock. If, by any chance, the vessel is moving too rapidly, the chain remains in position and pays out slowly under hydraulic control till it brings the ship to a stop.

Entering the First Lock.—Having passed the chain, the

vessel enters the lower lock. The gates are closed behind it, and through openings in the floor, water enters, filling the lock chamber to the level of the water in the lock above.

Lifted to the Second.—When this level is reached, the inflow of water is stopped. The gates between the lower lock and the one above are then opened, and the vessel is towed into the second lock.

Reaching the Lake.—When it is inside, the gates behind it are closed, and water is again let in through the floor openings till the level in the second lock is raised to that of the third above. When this is accomplished the gates in front are opened, and the vessel is towed forward into the third and last lock, the water level of which is that of the lake. It is then ready to proceed under its own power on its journey through Gatun Lake.

Full Speed.—The channel through Gatun Lake varies in width from 1,000 feet to 500 feet, and is about 24 miles in length. A vessel can steam at full speed through this till it reaches the entrance of Culebra Cut.

Slower Through Culebra Cut.—Here the Channel narrows to 300 feet at the bottom. The vessel still proceeds under its own power, but at a reduced speed through Culebra Cut.

A Picturesque Journey.—The irregular lines of thickly clad hills which encircle the lake make the passage through it one of much natural beauty, but the picturesque portion of the journey is reached when the vessel enters Culebra Cut. Here for the first time the spectator gains a conception of the tremendous task which has been accomplished.

It is not a full conception for he is sailing on a water level 45 or 47 feet above the bottom of the excavation which was made and the height of the banks is diminished to that extent.

Still as he passes between the towering walls of the mountain range, if he be a true American, he will feel a thrill of pride and

City Hall, Panama City

patriotic enthusiasm at the work which his countrymen have accomplished.

The Pacific Locks.—Leaving the Culebra Cut the vessel advances to the first pair of locks on the Pacific side, at Pedro Miguel.

The vessel is tied up at the approach wall and is towed into the lock, as at Gatun, the water level in it being that of the lake.

Past Pedro Miguel.—When inside the lock the gates behind the ship are closed, and through the openings in the floor the water is let out until the level in the lock is that of the small lake below.

Lake Miraflores.—The vessel then passes into Lake Miraflores, a small body of water about a mile in extent, and proceeds under its own power till the first of the two locks at Miraflores is reached.

The Final Locks.—Here it enters the first lock, under the same conditions as prevailed at Pedro Miguel. The gates are closed and the water in the lock is let out into the second lock below until the two are brought to the same level. Then the vessel is towed forward into the second and the gates are closed behind it.

Finally, the water in the second is let out into the approach channel and the level in the lake is reduced to that of the sea. The gates are then opened in front of it, and it is ready to proceed into the Pacific ocean.

Time of Passage.—The time consumed in the journey ranges from 10 to 12 hours according to the speed of the ship.

The time consumed in passing the locks is three hours, one and a half hours in the three locks at Gatun and about the same time in the three on the Pacific side, or a half hour in each lock.

Value of Electricity.—The wonderful development of electricity as an agent in the great works of man is demonstrated

in a very impressive way in the operation of the canal, most of all in the locks.

Single Control.—One man, in a building upon the top of the lock walls, controls every movement of a ship passing through the locks. He has before him a control board containing a representation, part model and part diagrammatic, of the flight of locks controlled by the respective series of switches. Standing at his switch-board the operator throws the switches, and, in response to his action, sees before him in model or diagram the progress of the fender chains as they rise and fall, the movement of the lock gates inch by inch, the opening and closing of the valves which let the water in and out of the locks and the gradual rise or fall of the water in the lock chambers, revealing to him the exact position of the vessel at every stage of its progress. The switches controlling the various motors, together with their indicators, are mounted upon the board in the same relative position as the machines themselves in the lock walls.

The system is interlocking, so that certain motors cannot be started in a certain direction until other motors are operated in a proper manner to obtain consistent operation on the whole, and to avoid any undesirable or dangerous combinations in the positions of the valves, gates, or fender chains. In this way and by the use of limit switches the factor of the personal equation in operating the machines is reduced to a minimum, almost mechanical accuracy being obtained.

Lighting the Canal.—The locks are brilliantly lighted by electricity in lamps grouped upon concrete poles 30 feet in height. The lamps are clustered under concrete hoods in such a manner as not to strike the eye while illuminating clearly all parts of the structures.

Along the line of the channel there are range lights of elec-

tricity except in the floating buoys marking the channel through Gatun Lake where acetylene gas is used.

The most powerful range lights, in high concrete lighthouses, are placed at the Atlantic and Pacific entrances. They will be visible for from 12 to 18 nautical miles at sea.

World Wide Benefits.—By opening a new ocean highway which will shorten great trade routes by thousands of miles, all nations will benefit, for the inevitable effect will be to cheapen transportation and reduce the price of commodities.

The new canal gives the continent of North America a continuous coast line from Labrador to Alaska, thus securing for the United States control of the commerce of the Western Hemisphere.

It reduces the distance between New York and San Francisco from 13,135 miles to 5,263—a saving of 7,873 miles.

It brings the west coast of South America, most of the large commerce of which is controlled by Europe, 3,000 miles nearer to the United States than to Europe, with the probable result of ultimately shifting control to the United States.

It will shorten the distance between New York and Yokohama by more than 3,000 miles, between New York and Melbourne by nearly the same distance, and between New York and Hongkong by 245 miles. This will give the United States the advantage in competing with Europe for the commerce of Japan, and place it on equal terms with Europe so far as distance is concerned, in competing for the commerce of Australasia, China and the Philippines.

Valuable Savings.—Congress has acted wisely in accepting the suggestions of Col. Goethals in regard to inducements for the shipping of the world to make use of the Panama Canal. It has decreed that supply stations, under government control, be maintained at both ends of the canal by means of which coal,

RESIDENCE OF SUPERINTENDENT PANAMA RAILROAD AT COLON

fuel oil, cold storage provisions and all other necessary supplies, as well as repairs, will be furnished to vessels passing through the canal at fixed and moderate prices. This will permit vessels sailing from European and other distant ports through the canal to cut their bunker and provision spaces over half, add thereby to their cargo capacity and make valuable savings.

Cheaper Commodities Sure.—Whatever else may be the effect of this new ocean highway, cheaper commodities for the world can safely be predicted. Direct competition along many great trade lines cannot fail to secure this result.

By bringing the nations of the earth into closer relations, and by developing the commerce of one with another and enhancing its value, the peace of the world will be more firmly secured, for the cost of wars, in disturbing and destroying commerce, will be an increasingly powerful influence against them.

Wanted American Ships.—According to the most trustworthy authorities, when the Panama Canal is thrown open to the commerce of the world, on Jan. 1, 1915, there will be in the merchant marine of the United States only about 30 ships of sufficient size and capacity to use it with profit.

It is the opinion of most shipping authorities that no ship of less than 3,000 gross tonnage, can do a profitable business through the canal, and some of these authorities place the limit at 4,000 gross tonnage.

Sailing Vessels.—There is slight probability that sailing vessels will use the canal. They would have to be towed from deep water in the ocean, as well as through the canal, and, in the case of the Bay of Panama, in the Pacific Ocean, they would in nearly all cases have to be towed about 100 miles before entering and after leaving the canal for that bay is deep and sheltered and nearly devoid of wind during most seasons of the year.

The opening of the Suez Canal caused a great reduction in

the number of sailing vessels, and the effect of the Panama Canal is certain to cause a still further reduction.

An Investment Ruined—The opening of the Panama Canal will ruin instantly and irretrievably the Tehuantepec railway route across the isthmus of that name. This was 30 years in building and cost the Mexican government $60,000,000. It was opened in January, 1907, and although it has had considerable traffic, it has been an unprofitable investment, its gross revenue being only about $3,000,000.

Hawaiian Ship Company.—The chief customer of the Tehuantepec Route is the Hawaiian Steamship Company which formerly operated a line of steamships from New York around the Horn to Hawaii and San Francisco. Since 1907 the ships of the company have used the Tehuantepec Route, but they will abandon it immediately when the Panama route is opened.

The company has the largest fleet of American merchant ships afloat, 18 in all, ranging in capacity from 5,400 to 8,500 gross tonnage, and is building five others with a gross tonnage of 10,000 each.

These ships will supply nearly the entire commercial fleet of the United States for Panama Canal traffic on January 1, 1915. There are only a few others of adequate capacity, on the Atlantic side, and only two or three on the Pacific side. There is considerable talk about building others but few of the projects in that direction have taken definite form.

American Ships Favored.—The new Panama Canal Act, passed in 1912, provides that foreign built vessels, owned wholly by citizens of the United States, chartered under the laws of the United States, or of any State thereof, whose presidents and managing directors are citizens of the United States, may be registered as vessels of the United States and engage in foreign trade only.

The same act provides that all materials of foreign production which may be necessary for the construction, repair and equipment of vessels built in the United States, shall be admitted free of duty.

Shipbuilding Cost.—It is estimated by ship builders and owners in the United States that it costs from 40 to 50 per cent. more to build a vessel in the United States than in Europe, chiefly because of the difference in wages and in cost of material.

The new Canal Act, it is thought, will lead to an increase in our merchant marine because of the provisions cited above.

President Taft's Views.—In signing the act, on August 24, 1912, President Taft said: "The bill permits the registry of foreign-built vessels as vessels of the United States for foreign trade, and it also permits the admission without duty of materials for the construction and repair of vessels in the United States. This is objected to on the ground that it will interfere with the shipbuilding interest of the United States. I cannot concur in this view. The number of vessels of the United States engaged in foreign trade is so small that the work done by the present shipyards is almost wholly that of constructing vessels for the coastwise trade or Government vessels. In other words, there is substantially no business for building ships in the foreign trade in the shipyards of the United States which will be injured by this new provision. It is hoped that this registry of foreign-built ships in American foreign trades will prove to be a method of increasing our foreign shipping. The experiment will hurt no interest of ours, and we can observe its operation. If it proves to extend our commercial flag to the high seas, it will supply a long-felt want."

Available Traffic.—The pre-eminent authority on canal traffic is Prof. Emory R. Johnson of the University of Pennsylvania. He was a member of the Isthmian Canal Commission

A View in Ancon Hospital Grounds

of 1900-01, known as the Walker Commission, and has been employed since by the Government as its "special commissioner on Panama Canal traffic and tolls." His report on the subject, published by the Government in 1912, is an inexhaustible mine of information from which I shall quote freely.

Ten and One Half Millions in 1915.—A careful investigation of traffic statistics, made in 1901, showed an available traffic for a canal at Panama of about 5,000,000 tons. In 1910, similar investigations showed an available traffic of over 8,000,000 tons. At the same ratio of increase, the available traffic when the canal is opened in 1915 will be 10,500,000 tons

Will It Pay?—The total cost of the canal, including the $40,000,000 paid to the French Canal Company, and $10,000,000 to Panama, will be about $375,000,000. Its operating and maintenance expenses will be about $3,500,000 a year. Its government and sanitation expense about $500,000 a year.

The interest on $375,000,000 at 3 per cent., will be $11,250,000. There is an annual payment to the Republic of Panama by the United States of $250,000. The sum of these four items is $15,500,000. If to this be added 1 per cent. per annum on $375,000,000 to accumulate a fund to amortize the investment, the total annual expense will be $19,250,000.

First Ten Years.—At the toll fixed by Congress, $1.20 per net ton, the same as that of the Suez Canal, with a traffic beginning in 1915 with 10,500,000 tons, and increasing at the rate of 60 per cent. a year, as the Suez traffic has, the Panama Canal within the first ten years of operation, will earn more than enough to pay the estimated operation, maintenance, zone sanitation and government, Panama annuity and interest charges, and it will be possible at the beginning of the second decade of operation to establish an amortization fund.

Division of Traffic.—The estimated shipping using the Panama Canal in 1915 and 1916 is divided as follows: Coast to coast American, 1,000,000 net tons; American shipping carrying foreign commerce of the United States, 720,000 tons; foreign shipping carrying commerce of the United States to foreign countries, 7,780,000 tons; total, 10,500,000 tons.

Amount of Income.—At $1.20 toll per net ton, the income from these three sources would be $12,600,000. With an annual income of 60 per cent. in the volume of traffic, the income in 1925 would be $20,400,000.

Competition with Suez.—The Panama Canal will start with less than one half the tonnage which passed through the Suez Canal in 1912. The increase in tonnage of the latter has been more than 70 per cent. during the last 10 years.

Its total receipts in 1912, $27,300,000, were the largest in its history. Its dividends to stockholders have steadily risen till they have reached 35 per cent.

Under the danger of loss of tonnage in competition with the Panama Canal, its managers may reduce the toll charges below the present figure of $1.20 a ton, and still feel certain of a handsome profit. This possibility must be taken into consideration in estimating the earning capacity of the Panama Canal.

Closest Competition.—The closest competition will be in regard to commerce with Australia, New Zealand, Japan, China and the Philippines. So far as distance is concerned, the two canals are on equal terms in regard to that traffic.

Benefit for United States.—Under existing conditions, in spite of the fact that distance has been against the United States, our country has had a fair share of the great commerce of Australia and New Zealand. In 1910 the value of that share was nearly $50,000,000—consisting of the export of American

manufacturers to those countries, and the import from them of wool, hides and other materials. Australia's commerce amounts to $130 per inhabitant, and that of New Zealand to $170 per inhabitant, or five times that of the United States per inhabitant.

Handicap Removed.—The United States has had its fair share in this great commerce in spite of its distance handicap. What must be the effect when the handicap is removed? It is only necessary to cite the distances saved by the Panama Canal to show that there can be only one answer to this question.

Savings Obtained.—The distance from New York and Adelaide via the Panama Canal will be 1,746 miles less than via the Cape of Good Hope. To Melbourne, the reduction will be 2,770 miles and to Sydney 3,932 miles. For the voyage between New York and Sydney vessels of 10 knots speed can save 15.8 days. A calculation has been made of the fuel expenses of a $10\frac{1}{4}$ knot freight steamer whose average daily coal consumption at sea is 38 tons. This vessel would save about $3,500 in coal expenses by taking the Panama route instead of one around the Cape of Good Hope, on a round-trip voyage between New York and Adelaide. For a round-trip voyage between New York and Sydney, the fuel expenses via Panama will be about $6,230 less than by way of the Cape of Good Hope. In making this and other calculations, the 1912 contract prices for coal are taken.

Coal Prices.—It is assumed that the price of coal at Colon or Cristobal will be $5 per ton and at Balboa $5.50 per ton. These prices are about $1 above the cost of coal delivered at the end of ship's tackle on the Isthmus of Panama at the present time. Under present contracts, the United States Government is securing 500,000 tons of coal per annum, delivered at the end of ship's tackle at Cristobal for $4.09\frac{1}{2}$ per ton. It is believed in making the coal calculations above referred to that somewhat

QUARTERS OF CANAL WORKERS, CRISTOBAL

less than $1 per ton will amply defray overhead expenses, depreciation of fuel and lighterage charges, and that the United States Government can, without loss, sell coal, delivered in ship's bunkers, at Cristobal for $5 per ton. The 1912 contract prices for Welsh coal at Port Said, Suez Canal, are from $6.20 to $6.32.

The action of Congress, in decreeing that coal shall be supplied by the United States Government at both ends of the canal at reasonable prices, makes certain the permanent existence of this great inducement for vessels engaged in far-eastern commerce to use the Panama route.

National Benefit.—An examination of the possibilities of increased commerce which the shortened line of travel will secure shows that all sections of the United States will be benefitted thereby.

Advantages for the South.—The canal will give the Southern States for the first time a direct route for their chief product, cotton, to the markets of the Far East. Heretofore their shipments have gone partly by rail to San Francisco, partly by vessels around the Horn, but mainly by way of New York and the Suez Canal.

All this will be changed. The Gulf ports will be nearer to the Colon entrance of the canal than New York is by from 500 to 760 miles. They will thus have the advantage over eastern ports in the shipment of products to the Orient.

Japan and China.—Japan and China have for years been large purchasers of raw cotton and cotton goods, and the shorter route is certain to make these countries larger consumers because of the reduction in price caused by lower freight rates.

The iron and steel industries of the South, which have shown such remarkable growth, the lumber business, its forest products

—turpentine, resin, tar, etc.,—its fertilizing industry, these also are certain to be greatly benefitted for the same reason.

Gulf Commerce.—The commercial importance of the Gulf ports, already advancing, will be greatly increased by the opening of the canal. All points south and west of Lake Superior, Northern Michigan, Lake Michigan, and a line drawn from Chicago through Indianapolis, Frankfort, Ky., and on to Charleston, are nearer to New Orleans and to several Gulf ports than to New York.

Distance is a powerful, though not a controlling factor, in determining traffic routes, and there can be no question that the Gulf ports, through their ability to bring the railway car and the steamer side by side at terminals, in addition to their ability to assure a shorter and quicker passage, will add enormously to their commercial importance.

Northeastern States.—The Northeastern section of the United States ranks first in manufacture and foreign commerce. It has a large foreign trade in manufactured products, made partly from domestic and partly from imported materials. A portion of this imported material comes from tropical and south-temperate latitudes of the Atlantic, Pacific and Indian oceans—nitrate of soda from Chile; lumber and grain from the Pacific coast; wool, meats and hides from Australia; teas, silks and mattings from the Orient; sugar, rice, jute, hemp, vegetable oils and gums from the British, Dutch and East Indies and Oceania.

Panama and Suez.—Europe secured a nearer market for raw materials by means of the Suez Canal. Our American manufacturers will obtain the same privilege, in equal measure, by means of the Panama Canal. The gain for American manufacturers cannot fail to go far to put them on an equal footing with their European competitors.

Four Great Activities.—The economic activities of the Northwestern States have been divided by Prof. Johnson into four groups of industries:

1. Mining, transportation and exportation of coal.
2. Manufacture of iron and steel and machines and tools made of steel.
3. Shipbuilding and maritime interests.
4. Various classes of textile manufacture.

That all these will be benefitted to a degree which cannot be predicted but which is certain to be large, by the opening of new markets and bringing nearer the markets of needed raw material, no intelligent observer can doubt.

The Central West.—The twelve States of the Central West are situated from 500 to 1500 miles from the ocean. The trade which the Panama Canal may bring to them will, on an average, be moved nearly 1,000 miles by railroad.

While the most important industrial resources of the section taken as a whole are agricultural, there are also large manufacturing interests in several of the States, large coal fields, natural gas wells, and timber forests.

The opening of the canal, by emphasizing the commercial importance of the Gulf ports, and giving fresh impetus to the work of improving the great river systems, will give the Central West the opportunity to choose between the Gulf and Atlantic routes of shipment, and the competition thus instigated will quicken industrial activity and secure better transportation facilities.

The Pacific States.—In many ways the opening of the canal will be of very great benefit to all the States of the Pacific Coast. A cut of 7,873 nautical miles in a total distance of 13,135, could not have any other effect.

Their great interests, grain, lumber, horticulture, fisheries

and mining, will all be benefitted. Their wheat, barley, lumber and non-perishable food products—nuts, raisins, olives and canned fruits, now go around the Horn to the United States and Europe. The shipment of fresh fruit for long distances, while likely to continue to be made largely by rail, is also likely, with modern refrigerating facilities, to be transported in steadily increasing amounts by vessels, as the time of transit through the canal is diminished with the advancing speed of steamships.

Larger Trade Assured.—The general effect of the canal upon the people of the Pacific Coast will be to enable them to buy more cheaply and to carry on a larger trade both domestic and foreign. The northern ports of the Coast will become the natural gateways for the export trade of Idaho, Montana and Wyoming and for commerce with British Columbia. Puget Sound, by being near to the great ocean highway to the far East, and through its ability to supply steamers with coal, is likely to become an important centre for the distribution of Japanese and Asiatic goods.

Coastwise Shipping.—It is thought to be certain that the opening of the canal will be followed by a great increase in the volume of coastwise trade of the United States. The combined tonnage of American ships at present engaged in that trade on the Atlantic, Gulf and Pacific seaboards exceeds 3,500,000. During the past decade the increase has been 38 per cent. It is a large and healthily increasing business and its operators look for a very considerable addition to its fleet of ships to attend to the larger volume of traffic which the canal will bring.

Foreign Service.—American shipping engaged in foreign trade has declined steadily for several decades until at present only about 9 per cent. of the entire foreign commerce of the United States is carried in American bottoms. Nearly all American ships engaged in handling our foreign commerce are

employed in our trade with Canada, the West Indies, Mexico and Caribbean countries. Only a very few are used in our long distance foreign trade.

A Credit to the Nation.—The Panama Canal is the supreme engineering feat of the ages.

It has been pronounced the greatest of the world's wonders of work.

It has been completed far ahead of the time fixed, for several million dollars less than the estimated cost, in a manner so excellent as to defy criticism, and without a shadow of scandal of any sort.

It is the work of Americans and the manner of its accomplishment has brought honor to the nation throughout the world.

It was a great administrative as well as a great engineering task, for the expenditure of $375,000,000 had to be regulated and guarded and a colony of 60,000 souls—the number of the canal workers and their dependents—had to be governed.

The Secret of Success.—Success, complete and honorable, has been secured because from beginning to end the task has been in able and honest hands. Fitness was the sole test of service, and the baleful touch of sordid politics was not allowed to fall upon it.

THE SUEZ CANAL

DATES FROM B. C. 1400

The Panama Canal has been thought of and talked about for nearly four hundred years, but the first Suez Canal was already finished and in use four hundred years before the time of Solomon. The historian Strabo declared that Seti, father of Rameses the Great, dug a ditch fifty-seven miles long and wide enough for the largest vessels of that day—fourteen hundred years before Christ—from Bubastis on the Pelusiac branch of the Nile, to Hieropolis on the Bitter Lakes, then the head of the Gulf of Suez, at the northern end of the Red Sea.

In the course of centuries, this became filled with sand and eight hundred years later, according to Herodotus, Necho II attempted to clear it, but desisted, after the lives of one hundred and twenty thousand men had been sacrificed in the desert, because of a prophecy that, should the canal be completed, Egypt would fall into the hands of the barbarians.

Likewise the Persian Darius, who took up the work a hundred years later, abandoned it because the engineering experts of the period feared that the land would be flooded. But Ptolemy Philadelphus, in B. C. 285, built a canal from the Nile to Arsinoe, not far from the present Suez. Cleopatra's fleet tried to escape through this canal after the Battle of Actium, but in the two centuries that had passed, it had fallen into disrepair and was unnavigable.

Roman engineers, under the emperors Trajan and Hadrian, cleared and repaired the old waterway, but when the Mohammedans under Amrou conquered Egypt, they found the canal once more blocked and, after vainly trying to keep it open, abandoned it again to the drifting sands of the desert.

Then Came Napoleon.—Soon after his conquest of Egypt, in 1798, Napoleon ordered his engineers to make surveys for a direct canal from the Mediterranean to the Red Sea. They did so, but hastily and imperfectly, because of the great hardships they suffered and the persistent hostility of the desert tribes, and so made the erroneous report that the level of the Red Sea was some thirty feet above that of the Mediterranean. (Only a few years later, Humboldt made the same mistake regarding the level of the Atlantic and Pacific at Panama). This revived the old fear that the re-opening of the canal would cause the Red Sea to deluge Egypt. Lieutenant Waghorn, of the Royal Navy, made surveys of his own that disproved this fallacy, and he continuously urged the digging of a canal.

His judgment as to the sea-levels was confirmed by an international board of experts appointed by the viceroy of Egypt in 1846, but his desire for a canal was over-ruled by the British representative, the famous Robert Stephenson, the father of railways. He naturally preferred a transisthmian railroad from Suez on the Red Sea, to Cairo. This was built, and cargoes, mail and passengers to and from India were transhipped across it, to the great profit of the Egyptian government.

Interest of Lesseps.—These facts were well known to Ferdinand de Lesseps, who had been a diplomatic representative of France in Egypt, as had also his father before him. There he had won the friendship of Mohammed Said, a Moslem prince of Parisian education and tastes, who became viceroy in 1854. Lesseps hurried to Cairo, and obtained the concession for a canal from Suez to the Mediterranean, where the new port it created was called, in honor of the viceroy, Port Said.

Lesseps, then about fifty years old, had had no training whatever in technical engineering. But he was a consummate diplomat and financier, and, while the engineering problems of

the Suez Canal were childishly simple, the diplomatic and financial difficulties were very great.

Hostility of Great Britain.—Egypt, though becoming more and more an independent state, was still nominally a province of the Turkish Empire, and a firman or decree from the Sultan was needed to ratify the canal concession. But British influence was then all-powerful at Constantinople, and Great Britain had never forgotten Napoleon's attempt to cut her off from India by conquering Egypt.

In vain did Lesseps point out that his was a private commercial company, and that the country to be most benefitted by a shorter route to India, such as it proposed to construct, would be Great Britain. The English Government could see nothing in his canal but an attempt to revive French domination in Egypt, and to separate that country from the Turkish Empire.

Failure Predicted.—At the same time, the English press ridiculed the canal project. It was denounced as another South Sea Bubble; a stockjobbing device of unscrupulous financiers. It would be a physical impossibility to build the canal; the entrances could not be kept open, the bottom would not hold water, the banks would collapse, and the sands of the desert would fill it up faster than it could be dredged out. And finally, if the canal could be built, it would be of no commercial use to anybody, as mails and passengers could be more quickly transhipped by the railroad, and as for freight, the canal would be of no use for sailing vessels and "steamers cannot compete with sailing vessels in carrying goods." In short, every objection and possibly a few more, that has been raised against the Panama Canal was first raised against the Suez Canal.

Zeal of Lesseps.—Lesseps was indefatigable. He hurried back and forth from Cairo to Constantinople, to Paris, to London, and to Cairo again, entreating, explaining and cajol-

ing. He wrote to every member of Parliament and repeatedly interviewed Lord Palmerston, the Prime Minister. He conducted a great series of public meetings throughout the British Isles, and constantly importuned the leading newspapers and merchants of the United Kingdom. Napoleon III, Emperor of the French, though much interested, was only a lukewarm ally, but in his beautiful wife, the Empress Eugenie, Lesseps found a constant and steadfast friend.

Gradually the tide of popular opinion turned in his favor, the British Government relaxed its hostility, and though the Sultan's firman had not yet given him formal permission, Lesseps felt that he could safely begin to dig the canal in 1859.

Financial Obstacles.—But the financial difficulty still remained. The London and Berlin bankers had refused to subscribe to the stock of "La Compagnie Universelle du Canal Maritime de Suez." Only a small amount could be raised in Paris, for French capital was needed at home, after the losses of the Crimean War. Nothing was left but to beg the money from Lessep's old friend, the Viceroy Said.

But he had granted the concession with the understanding that the canal was not to cost Egypt a single piastre, while fifteen per cent. of the revenue coming from its operation was to be payed into the Egyptian treasury, and after the lapse of ninety-nine years from its opening, the canal was to become the property of the Egyptian government. Nevertheless, Said willingly subscribed to 177,662 shares out of the four hundred thousand representing the total capitalization of the company, and after that there was no difficulty in raising the balance in France.

Work Begun.—In the meanwhile, constructon work had gone actively forward. The site chosen for Port Said, the Mediterranean entrance of the canal, was an unmarked spot on

a long, narrow mud-bank separating the Mediterranean from a great marsh called Lake Menzaleh. This mud-bank was pierced by the entrance of the canal, which was protected by two long piers, constructed of blocks of artificial stone made on the spot, of cement and desert sand. Gradually the narrow strip of land was widened, and on it was built the present city of Port Said. Two distinctions are claimed for that city to-day; first, that a ship can be coaled there more quickly than anywhere else, and second, that it is the wickedest place on earth.

A Simple Task.—Nothing could have been more primitive than the construction of the Suez Canal through the twenty miles of Lake Menzaleh. Thousands of Egyptian peasants scooped up the mud from the bottom with their bare hands, squeezed out the water against their bare chests and built up the banks with the clods, which were baked hard and dry by the sun. Through the shallow man-made channel followed dredges that pumped it out to its full depth of 26 feet, for a width on the bottom of 72 feet. The material excavated by the dredges was used to heighten and strengthen the banks.

The next ten miles, after reaching the mainland, were almost equally easy digging, eight of them running through another swamp called Lake Ballah. Then came one of the three places where anything like deep cutting was required: the Plateau of El Guisr. But this was simply a range of low hills, eight miles in width, nowhere exceeding 70 feet in height, and composed throughout of soft sand. This was easily scooped up by hand and carried away in baskets, or on the backs of donkeys, or on a light railway equipped with six locomotives and 250 cars. Compared to the "hard-rock job" of Culebra, the "soft-ground work" of Suez was a task for children. Not until the very end was any rock encountered, and the total amount blasted was only 42,000 cubic yards.

Beyond El Guisr was a natural body of water called Lake Timsah. Here sprang into existence the town of Ismailia, the half-way port of the canal. An unmarked spot on the desert, it was named after Ismail, who became viceroy on the death of his uncle Said in 1863. Six years later, Ismailia was a gay and flourishing little city of six thousand inhabitants.

Beyond Lake Timsah was a second plateau, that of Serapeum, five and a half miles wide. When this had been cut through, the waters of the Mediterranean were admitted with great ceremony and in the presence of the Prince and Princess of Wales, later King Edward VII and Queen Alexandra—into the natural depression of the Bitter Lakes, once part of the Red Sea, that had since become landlocked and whose waters had entirely evaporated, leaving a thick deposit of salt.

Only twelve miles remained to Suez, four of these through the third and last plateau, that of Chalouf. Here the only ledge of hard rock encountered in the whole course of the canal was uncovered and blown up barely in time to clear the channel for the formal opening in 1869.

Length and Cost.—The total length of the Suez Canal is just under 100 miles, or twice that of the Panama Canal. Its cost is difficult to state exactly. The present capitalization of the Canal Company is approximately one hundred millions, on which it earns a gross revenue of 16%, and a net return of 7.6%, in an average year. But instead of Egypt's receiving 15% of this comfortable income, as originally agreed on, that country does not receive a cent from the canal that has cost her, directly and indirectly, in money and in human suffering, a sum that can only be computed in hundreds of millions.

Bankruptcy of Egypt.—As the ancient oracle had prophecied to Necho, the completion of the canal has caused Egypt to fall into the hands of the barbarians.

When Mohammed Said became Viceroy in 1854, Egyptian finances were sound, and the country did not owe a cent. Said borrowed the money to purchase his canal shares in Europe, at 10%, and, finding how easy it was to get money simply by signing a harmless-looking bit of paper, he proceeded to borrow more and more.

Said promised to supply the forced labor of his subjects on the canal. In return for what was practically an unlimited supply of slaves, the canal company agreed to feed and house the thousands of Egyptian peasants and look after their health. This was neglected, however, and thousands died of hunger, thirst, and disease. There were several needless epidemics of cholera. English philanthropy, backed by English political and commercial hostility to the French, put such pressure on Ismail, the successor of Said, that he withdrew the forced labor. Lesseps and his associates claimed that this was a breach of contract, and succeeded in having their claims submitted to the arbitration of Napoleon III. The Emperor of the French not unnaturally awarded the French company very heavy damages, amounting to over fifteen million dollars, more than enough for the purchase of labor-saving machinery with which to complete the canal.

A smaller canal, bringing fresh water from the Nile, was built in a course roughly parallel to the main waterway. Besides supplying the workmen, the fresh water was extremely valuable in irrigating the desert lands and supplying the cities of Ismailia and Suez. All the cost of this irrigation was borne by Egypt, all the profit went to the Canal Company.

Costly Inauguration.—Over twenty-one million dollars were squandered by Ismail in the gorgeous celebration of the opening of the Suez Canal. The Empress Eugenie, on the Imperial yacht "L'Aigle" led a long procession of French,

English, Austrian, Italian, Swedish and Egyptian yachts, warships and merchant vessels through the new highway between East and West Moslem Ulemahs and Christian Bishops invoked their blessings. Verdi, then the best-known composer, was engaged to write an opera, an opera house was erected and a company of the most brilliant singers brought to Cairo, for what was to be the last as well as the first performance of "Aida."

Ismail now called himself Khedive, instead of Viceroy, of Egypt, having bought from the Sultan the right to use this title, which is practically equivalent to that of "King." He plunged deeper and deeper into extravagance and debt. When he could borrow no more, he sold his country's 15% share in the earnings of the canal company. Finally, he decided to sell the 177,662 shares of its stock he had inherited from Said.

Purchased By Great Britain.—The English Prime Minister, Benjamin Disraeli, later Earl of Beaconsfield, got wind of this, and bought up Ismail's shares before they reached the open market. By this shrewd purchase, the British Government gained control of the canal it had so long opposed.

Ismail's extravagances continued until by 1879, ten years after the opening of the Suez Canal, he had piled up the stupendous debt of four hundred and fifty million dollars. Egypt was bankrupt and her creditors impatient. The Sultan deposed Ismail, who died in exile sixteen years later, and his son Tewfik became Khedive.

Tewfik was young and amiable, but weak. In trying to economize, he neglected to pay his army, which his father had greatly increased and equipped with the most modern weapons. Led by a popular Colonel, Arabi Pasha, the army mutinied in 1882. The foreign quarter of Alexandria was sacked and burned and many English and other foreigners killed.

English Occupation of Egypt.—An English fleet bom-

barded Alexandria. An expeditionary force, under Sir Garnet, later Lord Wolsey, landed on the bank of the Suez Canal, encountered the Egyptian Army under Arabi Pasha in a strong position at Tel-el-Kebir, and utterly routed it. Since then, Egypt, though still nominally under the rule of the Sultan and the Khedive, has been governed by the English. Under their splendidly efficient and humane rule, the country's credit has been completely restored, the huge mass of debt largely paid off, and the Egyptian people enjoy greater prosperity and better government to-day than they have ever known in their history.

With five thousand British regulars in Egypt, the strong fortresses of Malta in the Mediterranean and Aden and Perim in the Red Sea, Great Britain has little cause to fear that any other power will seize Suez and cut her off from India. Moreover, by an international convention in 1888, the leading nations of the earth, including Great Britain and the United States, agreed to the neutralization of the Suez Canal.

Canal Enlarged.—Since its opening, the canal has been frequently widened and deepened, to keep pace with the increased number and growing size of the ships that pass through it. It is now 35 feet deep and has a bottom width of 135 feet. It has always been necessary, whenever two large vessels meet in the canal, for one to turn into the nearest dock or siding, dug out of the side of the canal at frequent intervals; and there tie up to the bank while the other ship passes.

This, however, is not true of the Bitter Lakes, where ships can steam as freely as if in the open sea or on the Gatun Lake section of the Panama Canal. Except in the Bitter Lakes, ships passing through the Suez Canal cannot steam faster than four knots an hour, for fear of bringing down the sandy banks with the wash from their propellers. Electric searchlights,

first introduced in 1887, make night navigation possible and double the efficiency of the canal.

Dredges are constantly at work keeping the entrances clear of silt, and removing sand and mud that is always accumulating in the channel.

The tolls on a vessel passing through the Suez Canal amount to $1.20 a ton, and $2 a head for adult passengers, exclusive of the crew.

Commercial Effects.—It was anticipated that the opening of the Suez Canal would do much toward restoring the old commercial supremacy of the Mediterranean countries. But the country that was most benefitted was the one that had done most to delay the building of the canal: Great Britain. As long as the trade between Europe and the Far East was carried on by way of the Cape of Good Hope, sailing ships could hold their own with steamers, for there were few coaling stations on the African coasts, and too much cargo room had to be sacrificed to bunker capacity. But the opening of the Suez Canal, by shortening trade-routes, made the iron screw-steamer more profitable than the sailing ship, and England had the necessary capital, the coal and iron, and the skilled ship-builders and engineers of the Clyde and the Tyne.

Growth in Japanese Trade.—Until recently, English ships have been overwhelmingly in the majority at Suez, but there is an increasing German competition for the trade of the Far East. In the last few years, there has been a significant growth in the number of Japanese vessels passing through Suez. But the American flag is never seen there to-day, except on a warship, an army transport or a yacht.

One unexpected result of the opening of the Suez Canal was that it brought the Philippines so much nearer Spain that large numbers of Spaniards hurried out to the islands to seek their

fortunes, and exploited the natives so vigorously that the latter rose in a series of revolts culminating in the possession of the Philippines by the United States. Even after the Panama Canal is opened, Manila will be almost equi-distant from New York by either route.

Traffic of the Canal.—During the year 1912, 20,275,120 tons of shipping passed through the Canal, an increase of nearly 2,000,000 tons over the year of 1911. The total receipts of $27,300,000 were the greatest in the history of the Canal. During the year 5,373 ships passed through the Canal, and of these 3,335 flew the British flag.

Statistics of the Canal.—Some idea of the saving of distance by the creation of Suez Canal can be obtained from the following statistics:

From England	to	Bombay,	via	Cape of Good Hope,	10,860	miles
"	"	"	"	Suez Canal,	4,620	miles
" St. Petersburg	"		"	Cape of Hood Hope,	11,610	miles
"	"	"	"	Suez Canal,	6,770	miles
" New York			"	Cape of Good Hope,	11,520	miles
"	"	"	"	Suez Canal,	7,920	miles

Ferdinand de Lesseps was heaped with honors after the successful opening of the canal that his tireless efforts had made possible. The outbreak of the Franco-Prussian War put an untimely end to the festivities.

THE PANAMA CANAL FLAT-GLOBE

ITS VALUE AND SUPERIOR ADVANTAGES AS COMPARED WITH THE OLD STYLE SPHERICAL GLOBE

The Panama Canal Flat-Globe and World History (Two Parts) comprise together a new Twentieth Century system of up-to-date geographical review and reference. The Globe gives a full presentation of the entire earth's surface in the proper relations of Continents, Countries, Islands and Water. The Geographical History gives an interesting and complete explanation and description of the earth's surface, from the points of Physical Geography, Mathematical Geography, and the History of the ages as shown in the political subdivisions of the earth. This Globe and Geographical History combined give to the mind of the reader a correct and full geographical education that is lasting and permanent, and both scholarly and commercial.

The word *Geography* means "Description of the Earth." The subject embraces exact knowledge of the distribution of phenomena on the earth's surface and explains the relations of man to his terrestrial environment. Amid what seas, land forms, soils, climatic conditions, varieties of animal and vegetable life and other phenomena of nature does man live and toil? How does each of them affect man and his enterprises? How does he utilize, modify, improve or subdue them? The purpose of the study of geography is to show where these phenomena are and to answer such questions as these; and the answers illumine the earth in its relation to man.

We cannot read history or the news of the day aright, nor understand what man is achieving, unless we are familiar with

world-wide geography; and first of all we must know the relations to one another of the various features of the earth's surface; and to do this, we must understand the distribution of these features over the earth.

An idea of the distribution of land and water, continents, countries, and islands over the entire surface of the earth, can be faithfully and accurately conveyed only by means of a globe such as this History explains. It is only on the spherical surface of a globe or by means of such a projection on a flat surface as that of the Panama Canal Flat-Globe that the different countries, seas, etc., of the earth can be shown exactly or approximately in their proper proportion and exact relation to one another throughout the whole extent of the world. On all other kinds of maps there is necessarily distortion of some parts.

An old-style ball Globe is very expensive and inconvenient, and few persons can afford such a luxury. The Panama Canal Flat-Globe has therefore been devised to bring within the reach of all a true conception of the earth's surface. It has practically all the advantages of an old-fashioned Globe and many advantages over it, while the cost is comparatively small.

It is our aim in this Geographical History to give a correct description of the earth from every point of view in connection with the Panama Flat-Globe illustrating the whole world.

The Panama Canal Flat-Globe is circular in form, perfectly flat, twenty-eight inches in diameter, and hangs against the wall. Each side of the Globe contains a complete hemisphere—that is, on one side the Western and on the opposite side the Eastern Hemisphere. You will see at once that by bringing the lines of latitude and longitude exactly opposite to one another, as we do in printing, you can follow the entire surface of the earth by simply turning your Globe over when going from one hemisphere or side to the other as with the ball globe.

A view of the world in its various aspects will be presented in these pages with references here and there to our Flat-Globe as illustrating the text, under the three heads of Physical Geography embracing the forces and phenomena of nature under which mankind is environed and lives upon the world; Mathematical Geography, with its interesting data in relation to the deferentials and equasions of time over the entire earth, in their relation to climate, seasons, crops, and the occupations and activities of mankind. National or Political Geography which gives the most important and latest facts concerning the continents and countries of the world, including their Islands, Colonies and dependencies.

PHYSICAL GEOGRAPHY

Physical Geography considers the different materials of which the earth is composed and the forces which act on them. It compares and treats of the functions of each. The rocks that form the solid parts of the earth, the waters that flow over them and the all-embracing atmosphere, together with their shapes, movements and uses and the solar and terrestrial energies that develop so many activities in matter, are among its topics.

A Family of Worlds.—The Earth is one of a number of planets that belong to the Sun, move around it, and derive their light and heat from it. Of the known planets, Mercury and Venus are nearer the sun than we are, but Mars, Jupiter, Saturn, Uranus and Neptune, in this order, are further away from it. The earth is the fifth in size, being smaller than Jupiter, Saturn, Uranus and Neptune, and larger than Venus, Mars and Mercury. Outside the orbit of Mars are many minor planets, or asteroids, of which over 400 have thus far been discovered.

Size of the Earth.—We are apt to think that our world is an enormous body, but it is really one of the smaller specks of dust that move through space. The universe is illimitable, and we cannot grasp it in our thoughts. We know at least that our entire solar system is only a point in space, and we need not seek outside this system for proof of the comparative insignificance of this dwelling-place of ours. Our satellite, the moon, is circling around the earth at a distance of 240,000 miles from us. Suppose we could place the earth and its satellite within the sun, the earth at its center; with the moon moving around the earth at its present distance, the sun would still extend nearly 200,000 miles beyond the moon at all points. The diameter of the sun is over 109 times the diameter of the earth through the equator.

Many of the stars are believed to be larger than the sun. All the stars are far-away suns, and the star that is nearest to us is so remote that while it takes only eight minutes for a ray of light to travel nearly 93,000,000 miles from the sun to us, it would take about three and a half years for the ray to reach us from the nearest star. Astronomers have calculated the distance of the nearest stars from us, but their figures are expressed in so many hundreds of millions of miles that they convey no definite idea to our minds.

The area of the earth's surface is computed at 196,712,000 square miles, or about sixty-five times the area of continental United States, exclusive of Alaska. Of this area, 144,712,000 square miles are assigned to the ocean, and 52,000,000 or about two-fifths, to the land.

Shape of the Earth.—The Earth is not a perfectly symmetrical sphere. This has been proved by careful measurements of the length of degrees of the meridian lines that are traced on the globe from pole to pole (p. 131 of this History). If the earth were a perfect sphere, the length of each meridian from equator to pole would be exactly the same. But the measurements show that there is a progressive increase in the length of the degrees towards the poles, and this could only occur by a flattening of the earth's surface at the poles. The result of all this investigation proves that the equatorial diameter is about 26½ miles longer than the polar diameter, so that each pole is compressed about 13¼ miles. The mean equatorial diameter has a length of 7,925.65 statute miles, and the mean polar diameter is 7,899.17 miles long. The circumference of the equator is about 24,902 miles.

Density of the Earth.—It is certain that the materials deep under the earth's crust are heavier than the rocks which form its surface, because the force of gravitation increases to-

wards the center, thus augmenting their density, or, in other words, their weight. Experiments made with pendulum and plumb-line on the earth's attraction indicate that the earth weighs about $5\frac{1}{2}$ times as much as it would if it were composed entirely of water, and therefore its density is computed to be about $5\frac{1}{2}$. The density of the other planets varies from 1 to 7; that of the sun is $1\frac{1}{2}$, and of the moon $3\frac{1}{2}$.

The Atmosphere.—Encircling the earth and as much a part of the phenomena of our planet as its land and water, is an invisible ocean of gas and vapor which we call air. It is the outer envelope wrapped around the planet, and its distinctive name, Atmosphere, means vapor-sphere. Astronomers believe, from their observations of the heights at which meteors, dropping into our atmosphere, become red hot through friction against the air, that this gaseous envelope extends about 500 miles above the surface of the earth; but only a few miles above the sea level it becomes so light and thin that it will not support human life.

Chemists have found that air is composed by weight of over three-fourths nitrogen and not quite one-fourth oxygen; solid particles, such as the dancing motes we may see in a beam of sunlight, are always present, consisting chiefly of little specks of dust, and sometimes also of minute living germs from which lowly forms of vegetable or animal life may spring. Rain washes out many of these tiny motes, and thus acts as a purifier of the air.

Movements of the Earth.—Our world is travelling through space with wonderful rapidity. It revolves around the sun every year; and every day in the year it turns or rotates on its axis. Why does the earth keep moving? The reason is because in empty space it meets no friction or other impediment to retard or stop its motion. The air does not impede it, because it is a part of the earth and moves with it. The two motions of the

earth will never cease, unless as much power is exerted to annul them as was applied to produce them.

The Earth's Revolution.—Why does the earth move around the sun? Every particle of matter in the universe tries to attract or draw to itself every other particle. This is called the attraction of gravitation. Some force impelled the earth to move forward in a straight line, but the force of gravitation is exerted at the same time to draw it to the sun; and these two forces, continually exerted on the earth, are so adjusted that instead of shooting off into space or falling into the sun, our globe revolves around the sun in a nearly circular path, which is called its orbit; and the period of time we call a year is merely the time in which the earth makes one complete revolution around the sun.

Our globe is rushing along its orbit at the rate of 68,000 miles an hour, or 1,632,000 miles in a day. We are travelling over 600,000,000 miles every year in our great annual journey around the sun. The direction of both the revolution and the rotation of the earth is from west to east.

If the two forces, propulsion and gravity, were exactly balanced, the earth's orbit would be a perfect circle; but as they are not, the real form of the orbit is an oval or ellipse. The result is that our globe, at one part of its course, is nearer to the sun than at another, its average distance being computed at 92,800,000 miles.

Lengthening and Shortening of Days and Nights.—A peculiarity of the earth as it swings around the sun causes the changes in the length of days and nights, and also accounts for the alternation of seasons. If the axis of the earth were perpendicular to the path along which it moves around the sun, the globe would be moving in a perfectly upright position, and day and night would be equal in length all the year. But the axis

is really inclined 23½ degrees from the perpendicular, so that the north end of it, or, in other words, the North Pole, points nearly to the Polar Star. Twice a year, March 20th and September 22d, the earth reaches such positions in its orbit that the sun is exactly vertical over the equator. Then the line between the dark and the sunlit half of the globe, dividing day and night, passes through the Poles, and day and night are each twelve hours long throughout the world.

Equinoxes or Equal Nights.—After the March equinox, the North Pole is turned towards the sun, and as the earth moves on its path, more and more of the northern half of it comes into the sunlight. The days grow longer and longer the further north we go, until, within the Arctic Circle, the sun does not set at midsummer at all, and at the North Pole the day is six months long. At the same time, the South Pole, turned away from the sun, has a night of half a year. Then as the earth goes on its orbit and the September equinox is reached, the North Pole begins to point away from the sun, the days shorten and the nights lengthen through the Northern Hemisphere, and the North Pole has its half-year of night, while the South Pole is in continuous daylight.

Alternation of the Seasons.—This is also due to the inclination of the earth's axis. During half the year the Northern Hemisphere receives far more sunshine than the Southern Hemisphere. This is the warm or summer season in the north, while it is the cold or winter season in the southern half of the world; for the next six months it is the winter season in the north and the summer season in the Southern Hemisphere.

When it is the summer half of the year where we live, the high temperature of the torrid zone advances to the middle latitude and the cold of the polar regions becomes less severe; but in the winter half-year, the cold of the polar regions is in-

tense, low temperatures advance through the middle latitudes, and the heat on the edge of the torrid zone is temperate. The half of the earth over which the winter season reigns receives the rays of the sun more slantingly; they are scattered over a larger surface, and consequently their power is less intense.

The earth is so small that it receives only a little of the sun's light and heat, but it is these gifts that make life possible on the earth.

The Seasons and Agriculture.—The two great farming regions are in the north and south temperate zones. The preceding section tells us that when it is summer in one of these zones it is winter in the other. This is a kindly provision of nature. The result of it is that the work of raising the food and vegetable fibres, the fruits and the grasses required by man and the domestic animals, never ceases. For several months in the year most of our farm lands are frozen solid to a depth of several inches or a foot or more; but in those very months the farmers of Argentina, Cape Colony, Australia and New Zealand are cutting their wheat, turning grass into hay and gathering the orchard fruits. The wheat harvest is in progress somewhere every month in the year. Even in the temperate zones there is much difference in the time during which the same crops are gathered. Thus in our Southern States, vegetables are grown much earlier than in our Northern States, and the North can draw upon this source of supply during the winter and early spring until its own vegetables mature; and if the wheat crop of the north temperate zone yields less than usual it is a great blessing to be able to draw upon the wheat that is grown in the south temperate zone several months later without waiting a whole year for the succeeding northern crop to ripen.

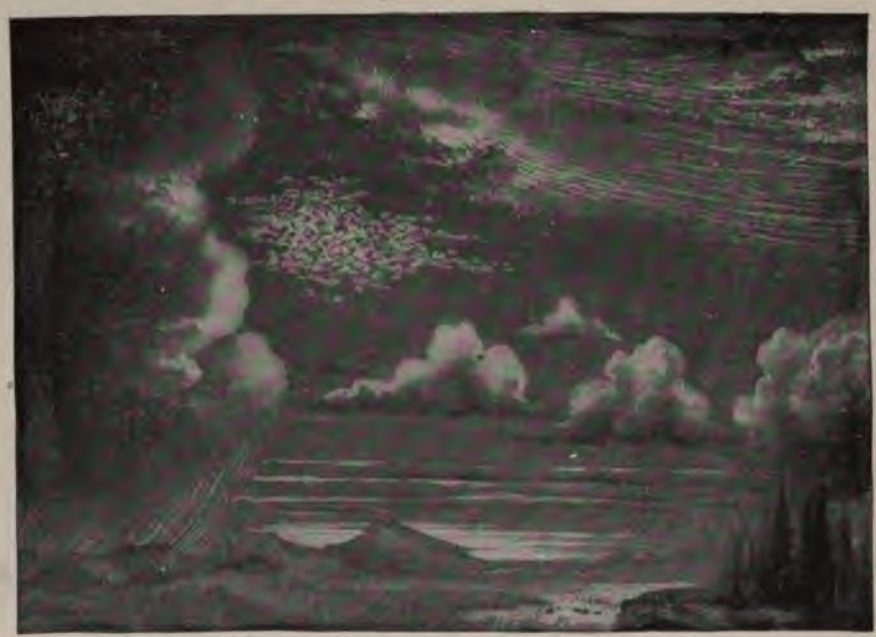
A little after midwinter the fine peaches, grapes, plums and other fruits of New Zealand and Cape Colony, carried thousands

of miles in cold storage, are found in the markets of London, and since 1902 in those of New York, while our own vines and fruit trees are still leafless. In the torrid zone, food may be grown the year around. But in the temperate zones, where vegetable food can be grown only a part of the year, it is a great advantage for the inhabitants of one zone to be able to draw upon the supplies raised in the other zone in another part of the year. So these differences in the growing seasons, together with cheap and rapid transportation, and refrigeration to preserve perishable products, help to bring all nations close together in business and social relations.

Rotation of the Earth.—While rushing forward on its path through space, the globe is turning around on its axis once in twenty-four hours, so that the sun is constantly rising on one part of its surface and setting on another part. So great is the speed of this rotation that we should be thrown off into space if it were not that the earth's attraction is more powerful than the tendency to fly off. This rotation causes the succession of day and night. We are not always wrapped in darkness when the sun is hidden from our view on the other side of the world, because in the part of every month when the sun shines on that face of the moon which is always turned toward us, the reflection of the sun's beams casts a gentle refulgence over the dark side of the earth.

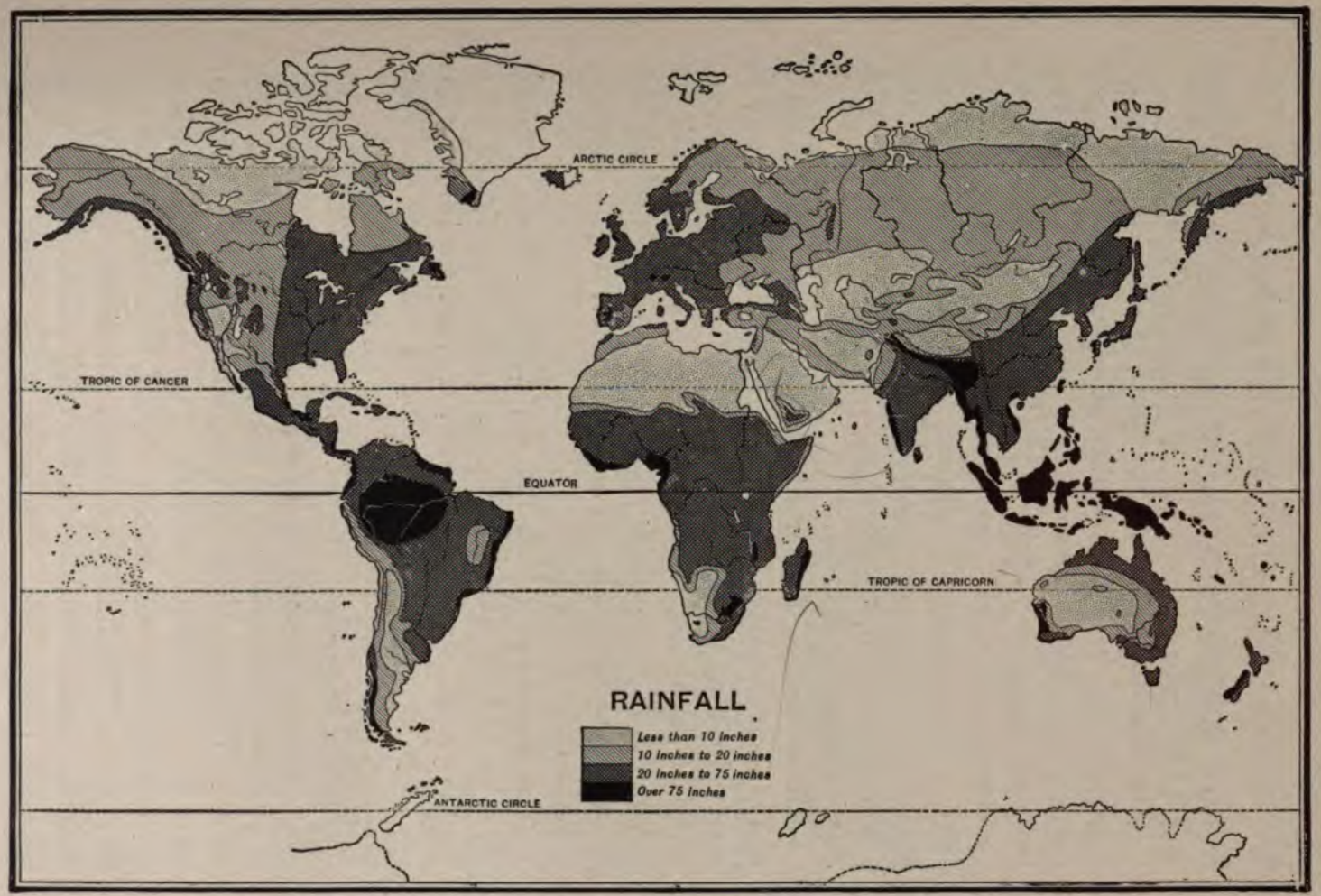
Clouds.—Vapor, by evaporation from water surfaces, enters the atmosphere, and when carried aloft may be cooled so far as to become condensed. This makes the air cloudy, and if the cooling and condensation are continued far enough will cause rain or snow. Frequently the moisture-laden air is condensed by cooling near the surface of the earth, and then we have fogs, which do not differ from clouds except that they are nearer the ground. There are numerous forms of clouds, but they are

classed under four principal types: cumulus clouds, rounded into great masses like heaps of wool, usually formed at the top of an ascending column of air; cirrus clouds, light and feathery in appearance, formed at heights of several miles, and consisting of snowflakes or tiny ice crystals; stratus clouds, which extend in long horizontal layers and are formed much nearer the earth than the cirrus clouds; nimbus clouds, widely spread cloud masses from which rain or snow is falling.



TYPES OF CLOUDS.

Rainfall.—This term includes rain, snow, hail and sleet. When water vapor condenses so far that the particles of water become too large for the air to hold them up, they are precipitated to the earth in one of the forms above mentioned. The vapor crystallizes into snowflakes if the condensation occurs at a temperature below the freezing-point. Sleet is half-melted snow. Hail usually occurs in summer, when the air currents of



The shadings show the distribution of rain all over the earth and the quantity usually falling every year.

lofty thunderstorms carry raindrops so high that they are frozen before they fall.

Thunderstorms.—The generation of electricity often accompanies the rapid condensation of water vapor. This production of electricity often occurs to such a degree as to induce frequent discharges of lightning from cloud to cloud, or from the clouds to the earth. Such a disturbance is called a thunderstorm. The discharges of electricity and claps of thunder may be terrific, particularly in the tropics. The rainfall in such storms does not often exceed an hour unless a second storm closely follows the first one.

Cloudbursts.—The term is applied to heavy downpours of rain of short duration. They occur in arid regions, and may be observed during the rainy season throughout the southwestern states of the Union, in northern Mexico, and in parts of the Sahara desert. As soon as they begin, veritable torrents rush down the mountain sides for an hour or more only to disappear as suddenly as they came.

The Rainbow.—When the sun shines on drops of falling water an arch of light is formed in the sky showing the colors that the prism reveals. This arch is called a rainbow. The sun's rays are refracted by each drop of water, and the white light from the sun is broken up into the colors which form it.

Aurora Borealis.—The quivering light seen in the north, but sometimes covering the whole sky, is called by this name. It is believed to be the result of discharges of electricity through the air. The data supplied by many observers seem to show that there is a belt of aurora borealis in the Northern Hemisphere, the center of the belt passing through Hudson Bay, northern Norway and Point Barrow, Alaska, thus encircling the world. A similar phenomenon (Aurora australis) is also observed in the Southern Hemisphere. The height of the aurora above the

earth's surface has not been satisfactorily determined, but it is believed that the electrical phenomena occur at no very great altitude.

Glaciers.—In very cold regions or in high altitudes falling snow accumulates instead of melting. It forms enormous heaps of ice in course of time. The weight of the top layers causes a creeping of the lower levels so that they project in tongues away from the main accumulation. To these projecting tongues the name of glaciers has been given. The phenomenon is in reality a flow of ice. In the Alps these glaciers move forward on an average of from 100 to 500 feet a year. Glaciers of great size occur in the Himalayas and in Alaska.

Icebergs.—Masses of floating ice that have broken from the ends of glaciers or from ice sheets. When glaciers move down valleys and push their fronts into the sea, the water tends to buoy up the partly submerged mass which breaks away, floats off and is called an iceberg. In the Antarctic, the seaward parts of the continental ice cap are often pushed into the sea and float away. These are called tabular icebergs. The breaking off and floating away of the end of a Greenland glacier was called by sailors the "calving" of the glacier and this expression is often used in scientific writings. Icebergs carry a great deal of stone and earthy debris which as they melt, they deposit on the sea floor. Icebergs are a menace to navigation; and since the sinking of the "Titanic," in 1912, patrol steamers have been kept, during the months of danger, along the northern trans-Atlantic route to give warning if they find icebergs there.

Terrestrial Magnetism.—This is the mysterious force in nature which causes the compass needle to point towards the north in most parts of the world. It is not yet well understood, but most students of physical science believe that it has its seat within the earth, though others think it may be due to cosmic

influences, such as changes in the sun. It was known centuries ago that the magnetic needle does not point to the true north, but is deflected to the east or west of it. This deflection is called the magnetic declination, and the amount of the declination for all parts of the world must be redetermined from time to time as it varies.

It was also found that when the magnetic needle is hung on a horizontal axis, the needle point may rise towards the sky or sink towards the earth. This is called the magnetic dip, or inclination. In 1831 the British polar explorer, James C. Ross, discovered a point on the west coast of Boothia, in the American Arctic regions, where the dipping needle pointed almost exactly to the center of the earth. This spot is called the north magnetic pole, which is believed to vary in its position, moving now to the east and then to the west. So little is known about it that Captain Amundsen left Norway with an expedition for Boothia in 1903 to ascertain, if possible, whether the pole really changes its position, whether it is a point or an area, and to study other magnetic problems. The position of the south magnetic pole has not been exactly determined. Many of the leading nations are now making investigations in the hope to increase our knowledge of the causes and results of the earth's magnetic condition.

Earthquakes.—Every one sees that many rocks of the earth's surface have been lifted or depressed, folded or broken. This shows that the earth's crust is subject to great strains and stresses which may become too severe for the rocks to withstand; the result will be a sudden breakage or movement that is felt at the surface as an earthquake. There is little doubt that at one time or another every part of the earth's surface has felt these disturbances, though the areas so violently disturbed, within the historic period, as to destroy human life and property,

are perhaps not more than one-fifteenth or one-twentieth of the whole surface. There are large regions where earth movements, or tremors, are almost incessant, such as parts of Japan and Venezuela. Seismographs record some 3,000 of these movements every year in Japan, but most of them are so slight that they can be detected only by these delicate instruments invented to record earth movements; and while Japan is a land of earthquakes, only forty or fifty very violent and destructive shocks have been recorded there since the fifth century of the present era.

Earthquakes usually originate near the ocean edge, though sometimes their starting-point is in the heart of the continents, as in the case of the New Madrid earthquakes in what is now southeastern Missouri and northeastern Arkansas; and sometimes the effects of earthquakes originating near the oceans are felt to the heart of the continents, as happened in the Charleston earthquake of 1886, when the earth-waves were recorded in southern Ontario and to the west of the Mississippi River. The opening of cracks in the earth usually accompanies these movements. Sometimes the fissures are wide enough to engulf houses, as in the Japan earthquake of 1891. The destruction of life is sometimes appalling. Thirty thousand persons perished in the Lisbon earthquake, 12,000 in the shocks that destroyed Caracas, Venezuela, and 10,000 Japanese lost their lives in the calamity of 1891. San Francisco was nearly destroyed by the same cause in 1906.

Earthquakes originating under the sea have sometimes involved the people of the neighboring coasts in dire calamity by waves that suddenly roll in upon the land, causing great destruction. The shocks travel through the rocks at the rate of about three miles a second, gradually growing feebler until they finally disappear. These catastrophes cannot be averted, but

the governments of earthquake countries, as Japan, are making earnest efforts to secure all information obtainable as to the origin and causes of the phenomena, and to teach their people what kinds of structures will best withstand severe earth-movements. They warn them against building their homes on the banks of rivers or the edges of cliffs, where they are most likely to be destroyed.

Volcanoes.—Among the violent processes of nature is the

MONT PELÉ, MARTINIQUE ISLAND, IN ERUPTION.

expulsion from the interior of the earth of molten rock, called lava, which is spread over the surface of the land or on the sea-floor. Sometimes the lava oozes gently from the orifice, or crater, but often it is accompanied by explosions of steam, which are a prominent feature of the eruptions of Vesuvius, or by

outbursts of gases such as in 1902 destroyed the city of St. Pierre in Martinique. Such eruptions are called volcanic. When the lava and dust poured through the crater are heaped up around the opening, the material in many cases is raised to a great height. The mountain thus formed is called a volcano.

The causes of volcanic eruptions are not well understood, but steam has undoubtedly much to do with the production of volcanic activity. We know that water may sink deep beneath the earth's surface through permeable rocks or fissures in the strata. Deep in the earth this water may become superheated, and in the form of steam may reach the air through some volcanic vent with terrific explosive energy, blowing the accompanying lava into fragments and scattering it far and wide, or tearing mountains to pieces, as was the case at Krakatao in 1883.

Volcanoes are found in all parts of the world, but many of them have lost their activity and are called extinct. They are defined as active when they are more or less frequently in eruption, and a dormant when they show only such faint signs of activity as sulphurous vapors or hot springs afford.

There are also colossal outflows of lava which do not form mountains, the lavas being so fluid that they flow far and wide, covering vast tracts of country with lava sheets, as in the basin of the Columbia River, in the northwest part of the United States. Where the lavas are less fluid they pile up around the crater, and the form of the mountain thus produced is usually conical. Sometimes the molten matter is forced up through long rifts in the strata and hardens into rock. This is the way that the Palisades of the Hudson were formed.

In accounts of eruptions we often read of flames and ashes; but students of volcanoes agree that there is very little combustion in a volcanic outburst. Steam is overwhelmingly the greater part of the vapors and gases emitted. About the only

inflammable gas in these eruptions is believed to be a small proportion of sulphureted hydrogen, but its quantity is too small to contribute much to the spectacular features of a volcano. It is quite certain that what appears to be flame in an eruption is usually the reflection of molten lava from the clouds above.

The term volcanic ashes does not mean the residue left by combustion, but the great quantities of dust and other finely divided debris that are often blown thousands of feet into the air.

Along the western coastal regions of the Americas are many great volcanoes, of which not a few in Latin America and Alaska are very active; but in the United States and Canada the number showing even slight signs of activity is small. Among the most famous volcanoes are Vesuvius, in Italy, whose eruptions, studied for 2,000 years, have sometimes been terrific. One of them in 79 A.D. overwhelmed the towns of Pompeii and Herculaneum. Stromboli, one of the Lipari Islands, has been called the "Lighthouse of the Mediterranean," because it is always active and illumines the sea for miles around at night. One of the largest volcanoes is Etna, in Sicily, 10,000 feet high and 40 miles in circumference, with craters not only on the top, but also on the sides of the mountain, where small cones have been built by eruptions. The active volcanoes of our Territory of Hawaii are in the island of Hawaii, the highest being Mauna Loa and Mauna Kea. A great number of the oceanic islands were formed by the outpouring of lavas, the increasing heaps finally appearing above the surface of the oceans. Java, Japan, Sumatra, and other parts of the East Indies are still a field of very great volcanic activity.

Eclipses.—Sometimes the sun is wholly or partially shut out from our view because the moon interposes itself between the earth and the sun. When a larger or smaller part of the sun is thus hidden from us it is called an eclipse of the sun.

At such times the shadow of the moon is cast on a part of the earth, and if we are in that shadow we see the eclipse; but though the moon has intercepted the rays of the sun which illumine the place where we are, millions of other people can see no eclipse because they are not in the shadow, and to them no part of the sun is shut out of sight. The outline of the eclipsed part of the sun is circular, because the moon is a sphere. If the full shadow of the moon is cast on the earth, the eclipse is total to all observers in any part of the shadow; but it is a partial eclipse if only a part of the sun's disk is shut out of sight.

When the moon is at its greatest distance from the earth the point of convergence of its shadow does not reach the earth. In such cases the central part of the sun's surface is shut out of sight to the observer near the central line, while the outer edge of the sun's surface is seen in all its brightness. This is called an annular eclipse of the sun.

An eclipse of the moon is caused in a different way. In the course of their movements the earth may come between the moon and the sun. If the moon passes through the shadow of the earth to such extent that the entire surface is in shadow, then it is a total eclipse of the moon. The form of the shadow seen on the disk of the moon is circular, because the earth, producing the shadow, is a sphere.

Sometimes the object that is temporarily concealed from us by the interposition of some other body between it and the earth is a star. This is called not an eclipse, but an occultation. The term is particularly applied to the occultation of a fixed star by the moon.

Sometimes the sun is concealed to a very small extent by the passage of Venus or Mercury across its face; in the same way, a bit of Jupiter may be concealed by the passage of one or another of his satellites across his disk. The term "transit" is applied

to such occurrences. Astronomers, calling mathematics to their aid, have long been able to foretell the exact time of these events; and they have often travelled half around the earth to witness an eclipse of the sun or a transit of Venus in the hope that observation under these peculiar circumstances would yield facts of much scientific value.

The causes of eclipses are simple enough when they are understood, but they have often thrown millions of persons into a state of wild alarm. In ancient Rome it was against the law to speak of eclipses as due to natural causes; and millions of the Chinese still believe that eclipses are caused by great dragons that are trying to devour the sun and the moon.

Phases of the Moon.—The moon always presents the same face to the earth. We might infer that the moon had no rotation on its axis, but this would be incorrect. As the moon revolves around the earth every month, all sides of it would be seen by us during this monthly revolution if it did not rotate on its axis. The reason why the same face of the moon is always presented to the earth is because it turns on its axis exactly as fast as it revolves around the earth and in the same direction. The moon makes only twelve rotations on its axis in a year, while the earth makes a complete rotation every day.

The moon does not always present the same appearance to us, and these differences of aspect are called the Phases of the Moon. The fact that now a larger and then a smaller part of the lunar face turned towards us are illumined by the sun is due to the moon's position in the heavens. The moon is a dark body, lighted only by the sun. When the sun is shining fully on the side of the moon, we cannot see the side turned towards us is dark except for a narrow bright border on one edge, which takes the form of a crescent. This phase is called the New Moon. As the moon moves along in its revolution and completes one-

fourth of its journey, the sun lights up one-half of the side we see, the other side remaining dark. The moon then presents the appearance of a semicircle. This is the First Quarter. When half the revolution is completed, the face we see is opposite the sun, which shines fully upon it. This is Full Moon. During the second half of the revolution, the same phases are repeated in the reverse order, and we have the Last Quarter, and then New Moon again.

Meteors.—These are small bodies that move through space, most of them, it is believed, being concentrated into large or small groups. When they appear in our atmosphere, they leave trails of light and, in popular language, are called "shooting stars." They are not stars, however, but cold and dark bodies that become superheated and visible only when they enter our atmosphere. As their average rate of motion is about 25 miles in a second, the friction of the air, when they dash into it, generates so high a temperature that they are usually dissolved and completely dissipated before they reach the earth. Some of the larger of these bodies resist the tremendous heating so far that the residues of them reach the earth and are usually called meteorites, or meteoric stones. Very few meteorites have been seen to fall, and there are not over nine or ten in the museums or private collections whose fall is a matter of record. No one knows how they came to be shooting through space, but they consist of substances that are common on the earth, though their chemical and mineralogical combinations are such that it is believed that they may be recognized as meteors even though their fall is not seen.

Some of them are nearly pure iron, with nickel, and others are chiefly stony with grains of iron. It is believed that they are falling into our atmosphere all the time, and of the shooting stars that are visible to the naked eye, any close observer may prob-

ably see an average of five an hour, though his range of vision is only 200 to 300 miles from his point of observation. The late Professor Newton, of Yale University, estimated that if observers might scan the entire heavens, the number visible daily would be found to be between 15,000,000 and 20,000,000. Professor Rees, of Columbia University, writes that millions of them travel together in the same swarm or group, with plenty of room, as the separate bodies are frequently miles apart. The best time to observe them is between midnight and the twilight before sunrise.

The stream of meteorites radiating from the constellation of Leo, which was last observed by telescope in 1866, had a breadth of not less than 100,000 miles and a length of 300,000 miles. It had been observed that the Leonids, as this swarm of meteors is called, usually reappeared every thirty-three years, and they were expected again in 1899, but failed to appear, owing doubtless to some unknown effect of the planetary pulls that disturbed their motion, for the group is subject to these influences from Jupiter, Saturn and the Earth. The first definite record of the fall of a meteorite was in Croatia on May 26, 1751. The ninth record was that of the Mazapil (Mexico) meteorite, weighing 10¼ pounds, which fell on November 27, 1885. The tenth fall recorded was that of the iron-nickel meteorite, weighing 107 pounds, that fell in Johnson County, Ark., on March 27, 1886. On March 12, 1898, a meteorite was seen to drop into the Gulf of Finland, making a clean-cut hole 30 feet in diameter through the ice; fragments of it were fished up in the following year. The largest meteorite in a museum was brought by the Arctic explorer Peary from near Cape York, Greenland, to the American Museum of Natural History, New York.

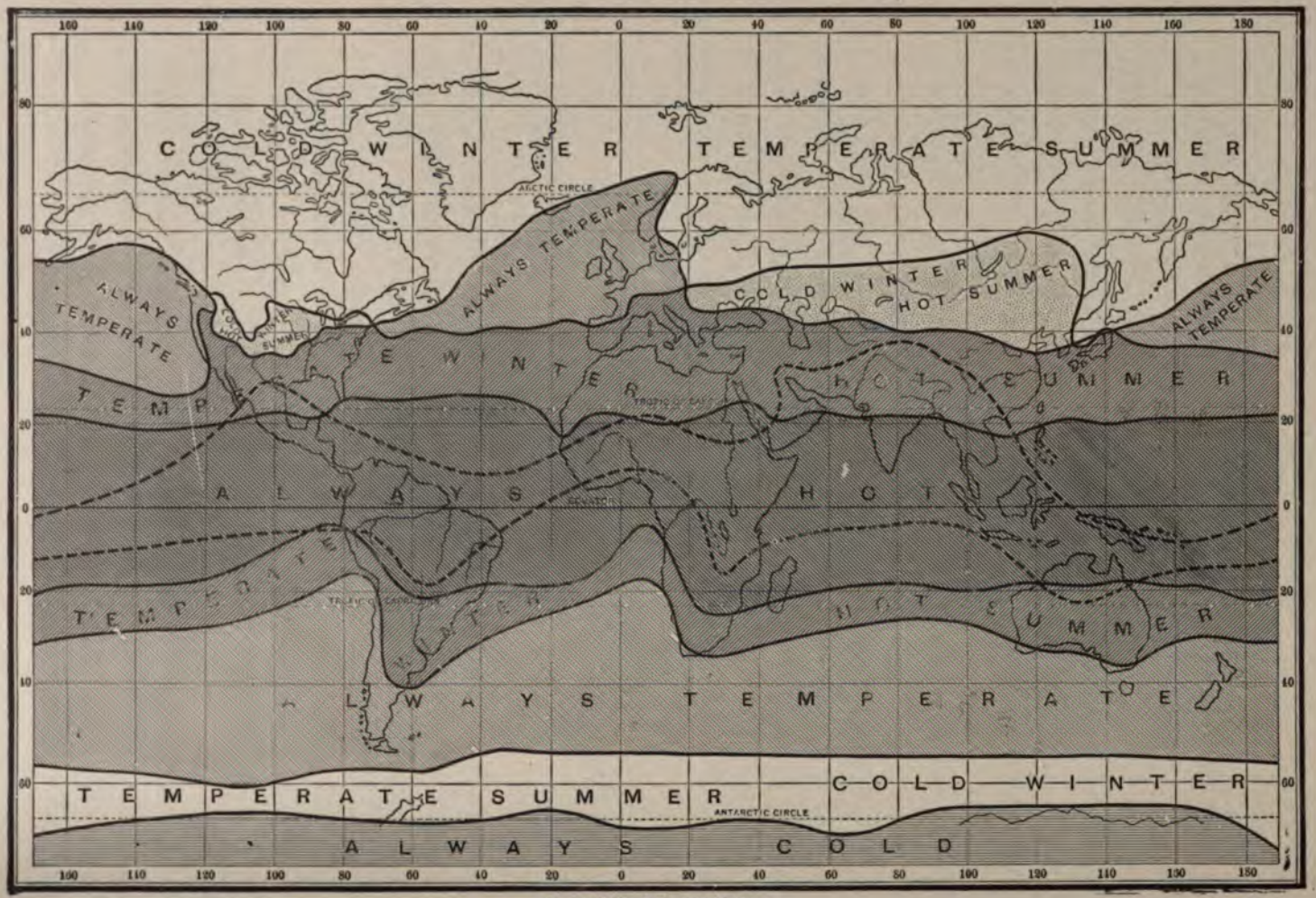
Comet.—The name is derived from the Greek word κομήτης, meaning "with long hair," and was doubtless applied to comets

on account of the hairy appearance of the luminous vapors characteristic of them. These celestial bodies are distinct from all others, and in some respects are not yet well understood. They consist of three parts: the nucleus, which, through the telescope, looks like an irregularly formed planet; the coma or nebulous light surrounding the nucleus, and the tail, a trail of light which on the greater comets sometimes extends over a long arc of the heavens. They appear to be fragments of nebulous matter. They have orbits the form of which, however, is likely to be changed by the attraction of the sun or of some planet, and sometimes they have been observed to start off on orbits that would never bring them back again to human ken. Their number is supposed to be very large, but only 30 or 40 that are visible to the naked eye appear in a century. The telescope usually finds five or six every year, and most of them are new ones. A few of the known comets reappear at definite intervals, while others have never been seen but once, and are not likely to return for centuries. Eighteen comets are known that revolve around the sun in periods of from three to seventy-five years.

Climate.—The average weather conditions of each region make its climate. No other influences are so great in deciding what animal and vegetable life may thrive in any particular region. The polar lands, the lofty mountains and plateaus need only higher temperature to make them teem with vegetation.

The world is girdled with distinctive zones of climate, each of which has enormous influence upon man's development and welfare.

In the tropical zone excessive heat and rainfall give the greatest luxuriance to vegetation. Man has few needs, supplies them easily, and his energy and ambition are little developed, because he does not have to struggle for existence.



CLIMATIC BELTS

Above are shown regular and variable belts of climate. See climate, page 93.

In the polar regions the struggle for life is very severe, and man is content if by the hardest work he can procure food and shelter and sufficient skins and furs to keep warmth in his body. The Antarctic regions have no human inhabitants.

In the temperate zones, between the climatic extremes, where nature is the powerful ally of human endeavor, man reaches his highest prosperity and best development.

Temperature and rainfall are the most important climatic elements. Temperature decreases not only with distance from the equator, but also with elevation above sea level, so that frigid conditions may prevail on the high mountains and plateaus even of the tropical zone, as well as at the Poles.

Invisible vapor rising from water surfaces (evaporation) is condensed in the cooler air above the earth and falls over land and sea as rain. The sea is the largest source of rain, and so most lands near the sea have much more of it than the far interior of the continents. But some of the prevailing winds blowing out to the sea from the land are dry winds, and so the coast is parched, as on the Atlantic edge of the Desert of Sahara. On the other hand, when the winds blow from the sea to the land they may become saturated with water vapor; thus the Amazon Valley, in South America, is drenched by heavy rains that the northeast trade wind brings. Winds are the transporters of climate, for now they carry warmth to the cooler regions, and then mitigate the glowing heat of vast areas by chill breezes from the polar latitudes. They also scatter the rain far and wide, so that the forests flourish and rich harvests are taken from the fields.

The Winds.—Air that becomes heated expands and is lighter than the surrounding air. The heavier air around it presses in and lifts the lighter air upward. There is difference then in the atmospheric pressures, and thus air is set in motion.

We may properly infer from these statements that differences of temperature are the primary causes of the differences in the weight or pressure of the air to which winds are due.

The air movement is kept up by differences in atmospheric pressures in various parts of the world. Where high pressure prevails the air moves towards a region of low pressure. These differences of atmospheric pressure determine the direction and force of the winds.

The location of regions of high and low pressure is shown on the weather maps by the use of isobars, which are lines drawn through places of equal pressure. You may observe on these maps that the arrows indicating the direction of the wind are pointed away from the areas of high pressure and towards those of low pressure. The winds of average velocity in the United States blow at the rate of from 5 to 14 miles an hour. Their velocity depends upon the steepness of the pressure slope or, in other words, the rate of the change of pressure along any line. Thus, when the isobars showing changes of pressure are close together, the pressure slope is steep and the wind is correspondingly high. Tornadoes sometimes blow at the rate of 200 miles an hour.

Winds are called Constant when they always persist in one general direction, like the northeast and southeast trade winds. The trade winds are due to the fact that the lower air in the heated equatorial regions is always warmer and lighter than the lower air to the north or south of them, and consequently there is always a movement of air towards the tropical belt from the cooler regions north or south of it. This movement of the lower air currents towards the equator is deflected to the west by the rotation of the earth; as winds are named by the direction from which they blow, we have north of the equator the northeast trade winds and south of it the southeast trade winds.

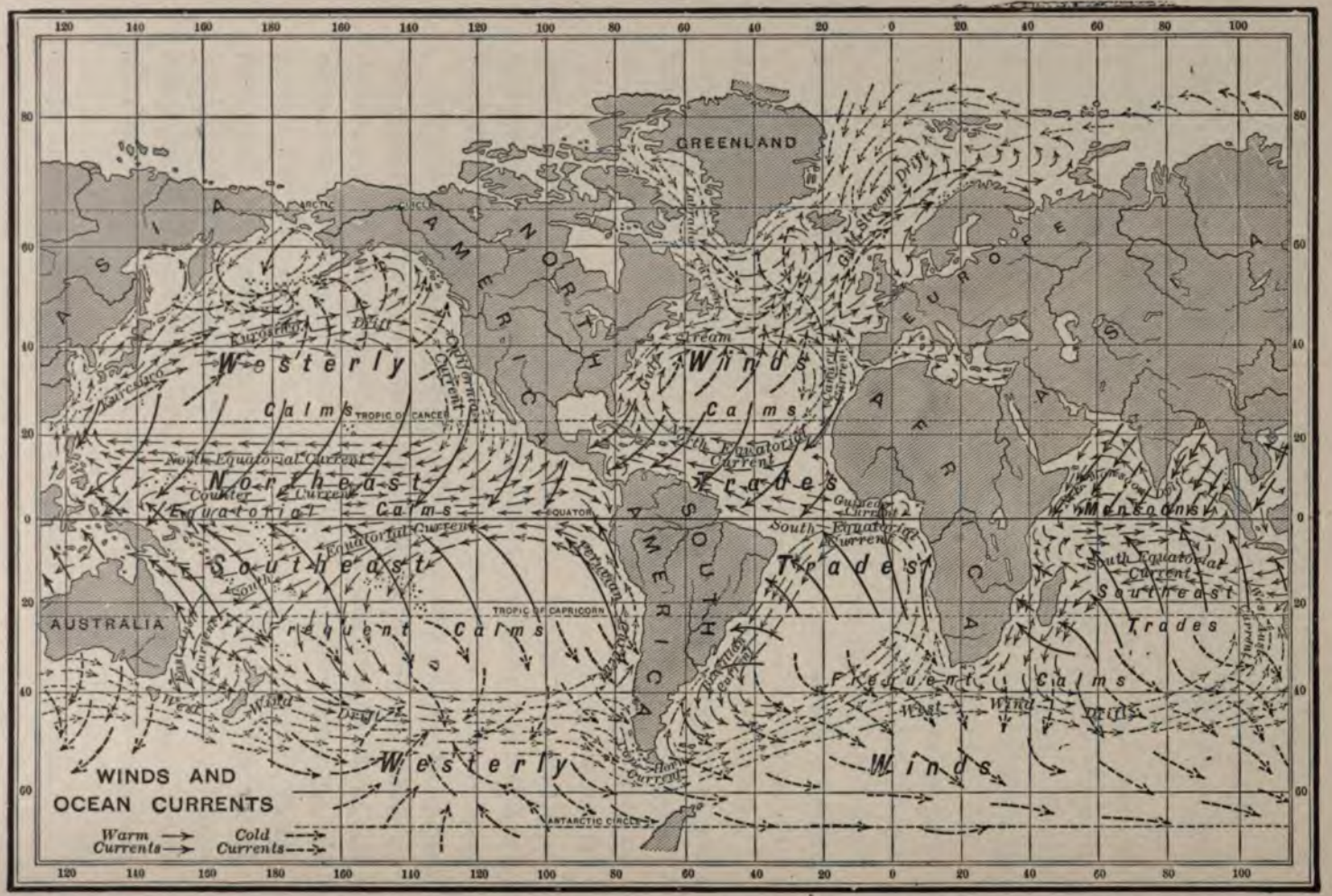
Winds are called Periodic if they blow regularly, part of the time in one direction, and part of the time in the opposite direction. We all know that the land is warmer in summer than the sea, and that the sea is warmer in winter than the land. When the sea is warmer, the air over it is warmer and lighter than that over the land, and so there is a movement of air from the land to the sea. These periodic winds are most marked in parts of south and eastern Asia. The high plateaus are intensely hot in summer, the air over them is rarefied, and the heavier air over the sea moves to the land. In winter the conditions are reversed, and the air movement is from the land to the sea. These periodic winds over the Asian lands and waters are called monsoons.

Another variety of periodic winds may be observed along sea coasts where the adjacent land and water are nearly of the same temperature; but the land is a little warmer by day and cooler by night than the sea, causing a constant succession of sea and land breezes.

Temporary winds are caused by differences of temperature in different areas, for we all know that the whole of a land or water surface is seldom equally heated; and in the lower atmosphere the air will move towards the warmer places.

Some winds are of great importance in commerce; such are the northeastern and southeastern trades, that blow steadily, though with variable force, all the year; the monsoons of Asiatic waters, which in winter blow south from Asia over the Indian Ocean and the China Sea, and in summer north from these seas over the land; also the anti-trades or western winds, between the fortieth and fiftieth parallels in both hemispheres, which speed sailing vessels from America to Europe and from Australia around Cape Horn.

Winds have important influence in modifying the forms of the



The general ocean and wind currents are here shown.

land surfaces. In the deserts they pile up long ridges of sand called sand dunes. Travelers on the trans-Caspian railroad may see these parallel dunes, like ocean waves, stretching away to the horizon. The northeast trade winds, starting in the Sahara, carry clouds of sand over the edge of the fertile lands to the south, slowly filling the valleys and destroying vegetation. During great desert windstorms the air is so charged with sand that it is difficult to breathe. Men cover their heads with cloth and lie on their faces, and camels hold their noses close to the ground.

Waterspouts.—Are due to exceedingly violent cyclones which occur at sea. Gyratory motion is established by the wind. The funnel shaped clouds which are formed reach the surface of the water and suck up huge columns of the liquid to which they impart a whirling motion. When the water reaches a certain height it breaks into spray and drops back into the sea.

Sandstorms.—Whenever the same wind phenomenon takes place over a desert stretch of land, sand instead of water is sucked up with the result that a funnel shaped column of sand rises into the air only to break up into particles that are scattered over vast areas.

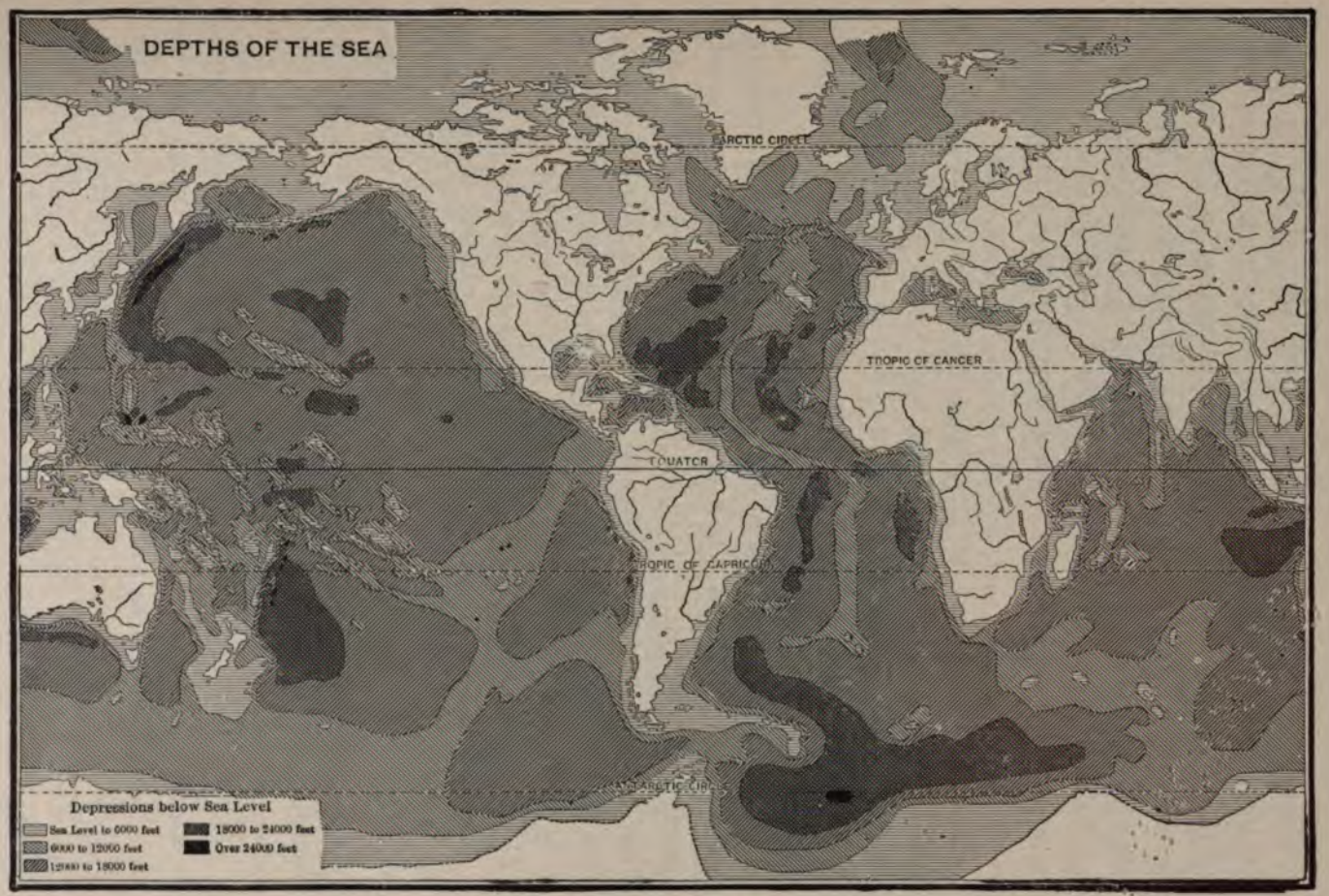
Tides.—Twice a day the edge of the seas advances upon the lands, floods the bays and mouths of rivers, and then as slowly retreats. This regular motion of the seas is the tide coming in and going out. It is caused by the strong attractive force of the moon and the lesser influence of the sun, the water yielding to the strain while the land is able to resist it. Tides are very helpful to commerce in many cases, as in the lower Thames, where large vessels could not ascend to London if they did not ride upon the inflowing tides.

Ocean Currents.—Our Flat-Globe outlines the great ocean currents. They are caused by the prevailing winds, and so have

about the same course over the seas. They affect the speed even of steamships; and sailing-vessels endeavor to keep out of the track of such currents as would retard their progress. A Pacific sailing-ship starting from Panama for the Philippines, for example, might gain forty miles a day by steering into the equatorial current flowing west, while it would lose nearly as much if it sailed in the equatorial counter-current moving east.

It was thought not long ago that the warm Gulf Stream of the Atlantic and the Japan current of the Pacific, the cold Labrador current and other ocean streams had much influence upon the temperature of the land. This view now has few advocates. The Gulf Stream as a distinct current really terminates in the mid-Atlantic. It is not the Gulf Stream, but the prevailing westerly winds, tempered as they are by the comparatively warm surface of the ocean, that are now believed to be the cause of the mild climate of the northwest coasts of Europe and the western coast of the United States.

Ocean Depths.—The seas are the greatest highways of commerce, and many of the routes across them, marked with the distances from port to port, are traced upon our Globe. Ocean exploration has greatly advanced within recent years, and many secrets of the sea depths have been revealed. While the ocean basins on the whole are steep-sided and flat-floored, some great depressions and chasms are discovered. The greatest depth yet found in the Pacific is 32,114 feet, near the Philippine Islands. Another abysmal depth to the east of Japan is over 27,600 feet beneath the surface. Through the mid-Atlantic extends a ridge stretching north and south, with water only 9,000 to 12,000 feet above it, while on either side the depths sink to 15,000 and 18,000 feet. The greatest depth yet discovered in the Atlantic is 27,366 feet in a small depression about 100 miles north of Porto Rico.



See ocean depths, page 18.

Distribution of the Lands.—Only one of the six great continents, Australia, is wholly in the Southern Hemisphere; North America, Europe and Asia, excepting a few Asiatic islands, are entirely in the Northern Hemisphere. Much the larger part of the lands lies in the Northern Hemisphere, forming almost a continuous ring around the North Pole, and stretching away to the southward in long, irregular masses which taper into points.

The continents are the largest areas of land. Europe and Asia are really one continent, but on account of their vast extent, it is more convenient to treat each of them as one of the "Grand Divisions." The term Eurasian has recently come into use to designate both continents together.

Hidden under the edge of the oceans that lap the continental shores is usually found a belt of sea-bottom sloping very gently seaward until a depth of about 600 feet is reached, where the slope becomes more abrupt and soon reaches oceanic depths. This belt of sea-floor is called the continental shelf. Sometimes it is wide and of great importance, because in these shallow waters the larger sea fisheries of the world are grouped.

Besides the continents there are two classes of islands—continental and oceanic islands. Most of the continental islands are near the continents and are formed of the same rocks, such as limestones, sandstones, granites, etc. The largest continental islands are Greenland, New Guinea, Borneo, Madagascar and Sumatra.

Oceanic islands may be very remote from large land masses, as most of the Pacific Islands, or they may be comparatively near the continents, as the Canary Islands or the Lesser Antilles. They are chiefly the result of volcanic outpourings from the bottom of the sea, or are upbuilt by coral insects in shallow waters.

Movements of the Earth's Crust.—We know that large

parts of the land masses were once under water, for many of the rocks were formed by deposits of sands or the bones of marine animals on the sea-floor. This shows that the earth's crust is subject to very slow up-and-down movements which are still in progress, and may be best observed along the margins of the seas; for we speak of the gradual uplifting of parts of the coasts of Scandinavia, of the gradual sinking of the coast of New Jersey, and of other similar movements that are now in progress. It has been found that the material carried by rivers into the sea increases considerably the weight of the ocean floor at their mouths. This addition in weight causes landslides. Some scientists believe that land disturbances such as earthquakes in New Mexico are due to the quantity of material deposited by the Mississippi River in the Gulf of Mexico.

These movements which lift or lower wide areas of land are very different from the quick, sharp earthquake shocks that sometimes lower the level of areas by a number of feet, as in the New Madrid earthquake of 1811.

Another kind of earth-movement is that resulting from the contraction of the earth's crust due to cooling; by this contraction the rocks of many areas may be crushed together, folded, broken, and here and there lifted into lofty mountain ranges. Other mountains may be the result simply of the dissection of high plateaus by running water which excavates valleys through the plateaus. The parts not worn away may be called mountains. This was the origin of the Catskill Mountains.

Forms of the Lands.—The earth has a great diversity of land forms, and they have marked effect in shaping the distribution and occupations of man. Coasts that are high, rocky and without inlets, like the southern shore of Sicily, repel seafarers and can have little or no shipping trade. Low, sandy, uniform coasts sloping very gradually into the sea, like the

western shore of the Golf of Pechili, China, are impediments to commerce. Few Chinese who live near this coast follow the sea for a living. Much of the time the sea is gnawing at the coasts, eating away the softer rocks, and thus forming gulfs and bays, while the harder rocks, resisting the attacks of the waves, jut out as headlands and capes.

The Atlantic coasts of the United States are mostly low, with many deep recesses where shipping is safe from ocean storms. Such a coast is highly favorable for commerce. The Pacific coast of our country, on the other hand, is high and rocky, with only a few good harbors; but these are so favorably distributed that they admirably serve the needs of commerce.

As our Globe shows, Europe, Asia and North America have very broken coast lines, and the sea in many places penetrates deeply into the land, giving the inhabitants large harbor facilities. On the other hand, Africa, South America and Australia have comparatively unbroken coast lines, and in this are at a disadvantage in commercial pursuits.

Erosion.—This term is applied to the general waste of land by rivers, winds, or other agencies. The infinite variety of form which the earth's surface presents is due in large measure to this process. Sometimes it is a mountain the sides of which have been carved into fantastic shapes, or else it is a plain with gentle undulatory features. As soon as mountains have been formed a general process of levelling begins. The streams that flow down the mountain sides carry away much material. Wide valleys are thus created. In these valleys waters may begin cutting new beds for themselves and cause gorges and canyons to intersect the former even surface. Any change on the surface of the earth which implies wearing away of the rock material comes under the head of erosion.

Mountain Ranges.—Our Globe shows the chief mountain

ranges which extend along the coasts or through the interior of the continents and islands. They have large influence in fixing boundary lines between nations and upon commerce and climate. With the Pyrenees, between France and Spain; the Alps, between Austria and Italy; and the Himalayas, between Tibet and India, we readily conclude that mountain chains often form not only natural boundaries between nations, but also between the languages of men.

They often impede commerce. Along the southeast coast of China are a number of fine natural ports, such as Amoy and Fuchau, but their importance is greatly diminished by the fact that mountains stretch between them and the densely peopled valley of the Yangtse, so that trade between this coast line and the interior is difficult and costly. If it were not for the Arlberg tunnel, intercourse between Austria and Switzerland would be very difficult; and Italy would be almost cut off from France and Central Europe if the Mont Cenis, St. Gotthard, and Simplon tunnels had not been constructed through the Alps.

All the railroads from the Pacific that have climbed the Andes Mountains of South America rise two miles or more into the air. It is fortunate for the United States that nature provided comparatively low passes among the Appalachian ranges in the eastern part of the United States to the Atlantic seaboard as gateways for great railroad routes; and that the passes through which our trains cross our great Western mountain ranges are reached by long and gentle slopes, so that few gradients are very steep.

Mountains are useful in many ways. They supply large water power. Our Western miners use this power to drive mining machinery. The wheels of industry in Switzerland are turned by the torrents that descend the Alps. Most mountains are clad with forests, and mountains are among the largest

sources of forest wealth. Water is retained in the form of snow and ice on the higher slopes till it is needed in the summer season of crops for irrigation far below. Mountain scenery is as substantial a source of gain as wheat or hay. Tourists leave millions of dollars in Switzerland every year, and our finest mountain regions are attracting more sightseers every year. Mountains also supply a large part of the metals and minerals, and are therefore the scene of large mining industries.

In every land we may see the effect of mountain ranges upon climate. Our Pacific ranges prevent the free circulation of rain-laden winds from the Pacific, which part with their moisture on the western slopes of the Sierra Nevadas, so that the great mountains to the east of them are arid. The Alps shield the Riviera from the cold northeast winds, so that Nice is warmer than Rome in winter. The mountains of Scandinavia stop the warm moist winds from the Atlantic, so that the Atlantic coasts enjoy the milder oceanic climate, while the Baltic coast is very cold in winter.

The highest mountain in the world is Mount Everest, 29,002 feet, in the Himalayas, on the border between Tibet and Nepal; the highest mountain of North America is Mount McKinley, in Alaska, 20,300 feet; of South America, Aconcagua, in Argentina, 23,081 feet; of Europe, Mont Blanc, in France, 15,780; in Africa, Kilimanjaro, 19,680; in Australia, Mt. Townsend, 7,347. The average height of land is calculated to be 2,440 feet.

Plains and Plateaus.—Most flat lands of the world lie between parallel mountain ranges that are often very far apart. Sometimes they lie in a narrow belt along the sea, and then are called coastal plains. When plains rise to a height of more than 1,000 feet above sea level, they are usually called table-lands or plateaus. These plains and plateaus are not a mere dead level, for they have undulations, ridges and valleys; but these heights

or hollows are not sufficiently pronounced to affect their generally level character. In the United States we see the Atlantic coastal plain between the Appalachians and the sea, and the vast region of plain, prairie and plateau that stretches between the Appalachians and our great Western ranges.

Every continent has wide plains far inland without sufficient rainfall to nurture forests or cultivated crops Grass here takes

Some Forms of Mountains.

the place of larger vegetation, the pastoral life is developed and grazing is the chief pursuit.

Valleys.—Between neighboring mountain chains are valleys, which usually form the bed of rivers; and rivers flowing across plains and plateaus excavate many valleys. Valleys through which navigable rivers flow are the most easily developed parts of the continents. It was these valleys that were settled first when man began to carry his industries and commerce into the interior of the continents. Thus great river valleys came to be

called the creators of history, because in the early days of development it was in the valleys of the Nile, Ganges, Indus and other large rivers that the human race made most progress.

Water Divides and Basins.—The boundary between slopes leading to different streams or rivers is called a divide. The divide is often easily recognizable. It may be the crest of a mountain range, or at least a ridge that is plainly above the general level. Frequently, however, on plains and plateaus the divide is almost or quite undistinguishable. In this case its course is uncertain and variable. There are rivers in Canada where the divide passes through some small lake that is so evenly balanced between two water systems that it sends a little stream to each of them; another illustration is Two Ocean Creek, in the Yellowstone National Park, where a bit of water is diverted sometimes toward the Pacific and sometimes toward the Atlantic.

The area included within the divide that separates a stream and its tributaries from another river system is called the basin of that stream. Thus the basin of the Missouri River is the entire area drained by that river; and the basin of the Mississippi system includes the vast area whose drainage is carried into the Gulf of Mexico through the Mississippi delta. The term watershed is sometimes erroneously applied to a river basin. It is more correctly used to designate a divide, but the terms "divide" or "water parting" for the boundaries between river basins are preferable.

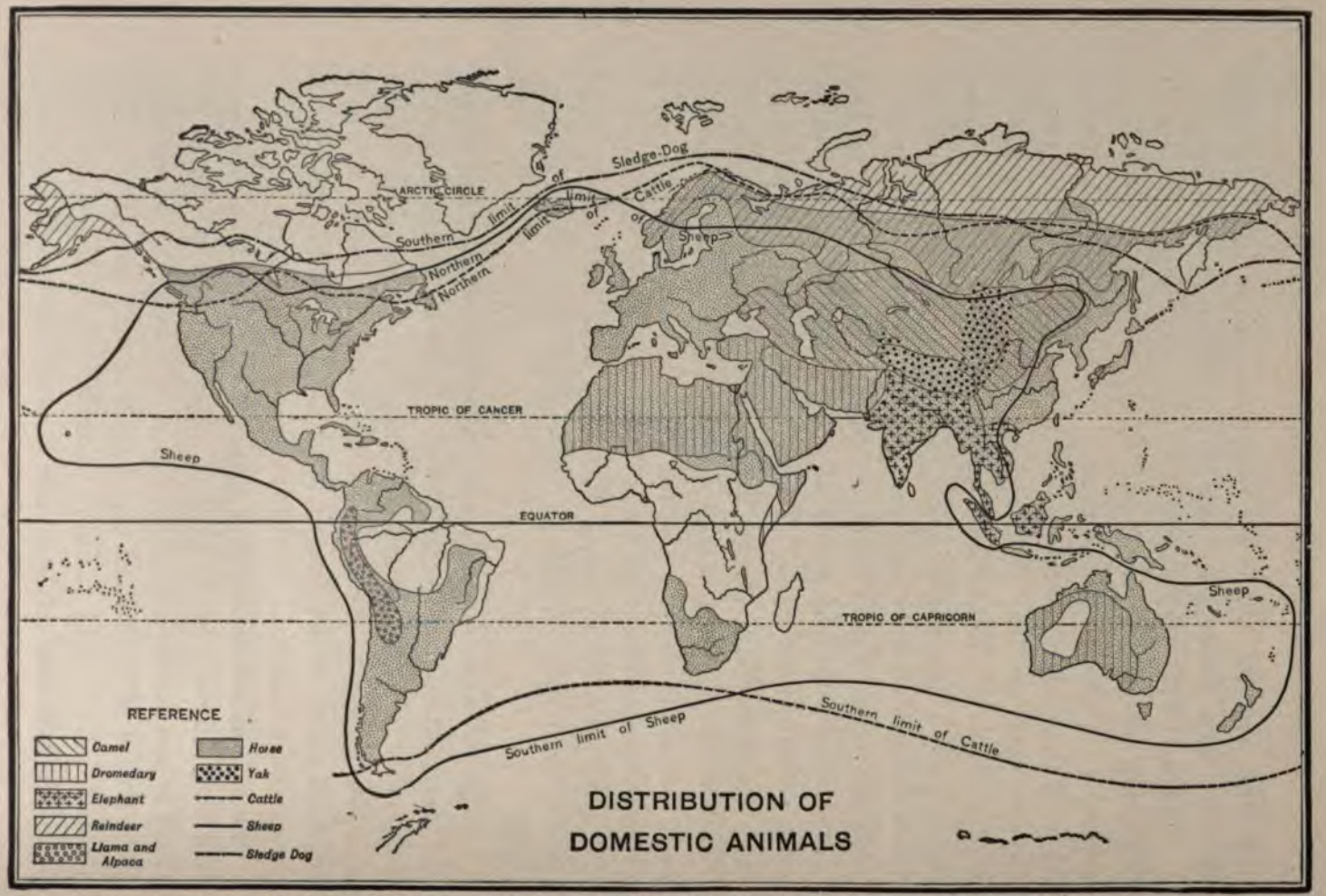
Seas.—Seas cover three-fifths of the world's surface. They affect man's life and activity in several ways: as climatic agents they are the source of rain and tend to equalize temperature; as highways they provide cheaper routes of transportation than the lands afford; as a source of food and other commercial commodities they contribute most of the fish that man consumes,

seal furs, seal oil, whale oil and bone, pearls from the pearl fisheries, large quantities of salt from evaporated water, etc.

Lakes.—The irregularities of the earth's surface due to crumpling or erosion have left many depressions below the general level into which drainage is drawn, thus forming lakes. Most of these lakes overflow, and their surplus is discharged by streams into the sea. The mineral matter that accumulates is thus removed and the lake waters remain fresh. Other lakes are formed in depressions where there is no outflow because the water receipts are fully counterbalanced by evaporation. In such lakes the salts washed from the soil and carried into the lake basins accumulate; the waters are therefore not potable, and the lakes are called salt lakes. The Great Salt Lake of Utah is the most important lake of this kind in the Western Hemisphere. This body of water is gradually receding. The waters evaporate, and their salt contents are added to the remaining water so that the lake carries more and more salt. One of the most famous salt lakes is the Dead Sea, in Palestine, which lies far below the level of the oceans and fills a small hollow surrounded by highlands.

Large lakes are very useful in commerce, because they permit the transportation of freight in the interior of the continents at small cost. The largest system of lake navigation in the world is provided by the Great Lakes of North America, on which steamers carry at low freight rates many times the tonnage of commodities that are borne through the Suez Canal.

Distribution of Animal Life.—No lands are so desolate that they do not give support to a considerable variety of life. Peary found flowers and grass, musk oxen and hare on the most northern bit of land which exploration has revealed to us. The animals that are most useful to man cover the whole of the temperate regions, and recently their numbers have been increasing



The elephant also lives in large parts of Africa, but the African elephant is not indicated on this map because he has not been domesticated as in India.

in the tropics. The horse, which is found everywhere in temperate and moderately warm countries, is being introduced to some extent into the tropical Congo region. At seventy stations in the Congo State, cattle from Europe are being successfully reared. Sheep are raised in most inhabited regions, woolless varieties being reared in hot countries. The range of the dog as a draft animal extends through the northern third of North America, and far towards the Pole, where he hauls sledges, while in Belgium and some other parts of Europe he draws carts to market. The hunting and fishing tribes of northern Europe and Asia use the reindeer as their means of transport. The yak is the conspicuous pack and saddle animal over the Himalayan passes and on the high plain of Tibet. The one-humped camel, or dromedary, is the "ship of the desert" in the northern third of Africa, while the stronger bactrian camel (two humps) is the beast of burden in central Asia. The donkey is important in the countries of the Mediterranean and in Mexico, elsewhere in America he is chiefly represented by his progeny, the mule.

The fisheries are the largest source of wealth derived from the wild animals. British America, northern Russia and Siberia are the regions from which most of the furs are derived, but the supply has been greatly diminished by over hunting. Civilized governments now endeavor to protect all wild animals that are useful to man so that they may not be exterminated. There are, however, no game laws for the protection of harmful beasts of prey, and most of the larger carnivorous animals, such as the lion, tiger, leopard and others, are being constantly depleted in number and are doomed to complete destruction within the next few decades.

Distribution of Vegetable Life.—Most human occupations are confined to the regions in which forests and cultivable and grass lands are predominant. The greatest regions of agriculture

are in the northern and southern temperate zones; grassy plains of enormous extent in North and South America and Asia nourish countless flocks and herds. Most of the wood supplies of the world that enter largely into commerce come from the great forest areas of the north temperate zone which girdle the land surface between the Arctic Circle and the 30th parallel, making the United States, Canada and Russia the foremost wood-producing countries of the world. Vast tropical forests, especially in Latin America and Africa, yield hardwoods that are in much demand, and, above all, rubber, which is extracted from a considerable variety of trees and vines.

The Races of Men.—There are a great many divisions of the human race, and detailed study shows that many of them are distinguished from one another only by very slight differences. Formerly classified into five great groups, a process of simplification has finally reduced them to three types—the black, yellow, and white races. The population of the world is now estimated at about 1,623,300,000, of which over 150,000,000 are believed to be included in the black, 600,000,000 in the yellow, and 750,000,000 in the white types.

THE BLACK TYPE.

The races of the black type are least civilized. The native home of the greater part of them is in Africa, south of the Sahara, and they are classed in the two subdivisions of negroes in the North and Bantus, who inhabit the whole of the great table-lands of that continent south of the Sudan. They are also thinly scattered in parts of southern Asia and in the Asian and some of the Pacific islands, the aborigines of Australia, the

Papuans of New Guinea, and Veddahs of Ceylon, and the Negritos of the Philippines, being most prominent. For three centuries the slave traders carried large numbers of African blacks to the Americas, where millions of them now live. The black races are backward in intellectual development, and have never succeeded in establishing perfected social organizations; but those of Africa in particular have shown themselves to be susceptible of great improvement. The black type has relatively the smallest part in the world's trade.

LI HUNG CHANG—THE YELLOW TYPE.

The races of the yellow type include the Mongolians of Asia, the Turks and Magyars or Huns of Europe, the Eskimos and Indians of America, and the peoples of the Malay and Polynesian islands. The Mongol, the most important and best characterized branch of the yellow type, has a number of varieties (Chinese, Japanese, Annamese, etc.) living in east Asia. The Japanese and Chinese are highly civilized and take an important part in the world's commerce. The Malayan races are widely disseminated over the Malay Archipelago, and include the Hovas, the most progressive race of Madagascar. The Tartars and Turks advanced from the steppes of Central Asia and settled in eastern Europe. The

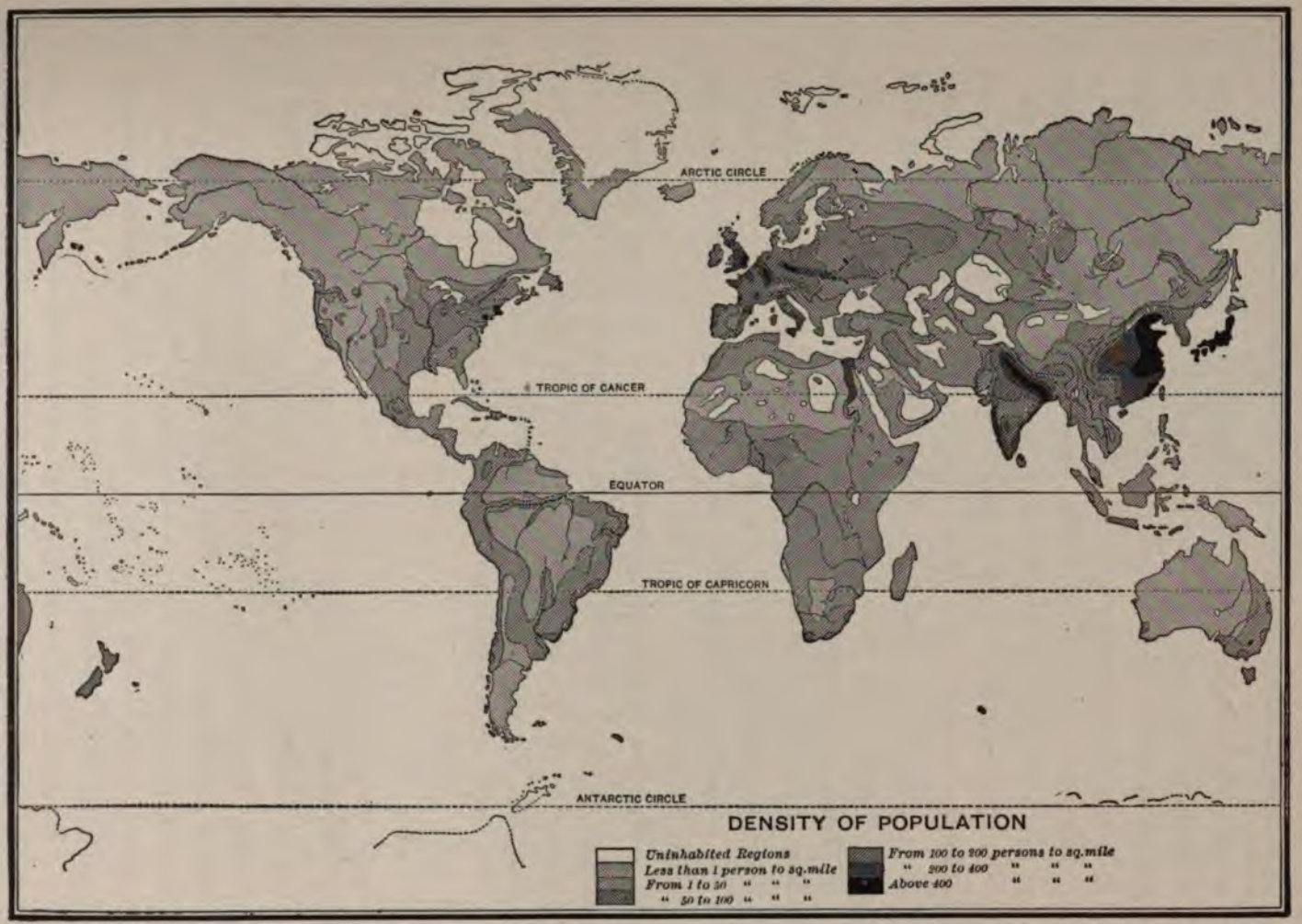
WASHINGTON—THE WHITE TYPE.

Finns and Magyars were also Asiatic emigrants who settled in northern and central Europe.

The white races, comprising the most civilized, advanced and progressive peoples of the world, are divided into three great groups: Hamitic, Semitic, and Aryan. The Hamites of North Africa (Berbers, Tuaregs, Gallas, Somalis, and others) are as dark in color as many races of the black type, are fanatical Mohammedans, and oppose the introduction among them of Western civilization. The Semites include the Arabs of Arabia, Syria and North Africa, and the Jews who are scattered over the whole world. The Aryans are subdivided into the Keltic, Teutonic, Romanic and Slavonic races, who inhabit the most of Europe. They have long been spreading rapidly, and now occupy nearly a third of Asia, have political supremacy over most of Africa, and have settled there in large numbers, especially in the north and south, and inhabit almost the whole of Europe, most of America and the larger part of Oceania. The Romanic races of south Europe have occupied Latin America, the Teutonic races of north Europe have spread over North America and Australia, and the Slavonic Russians have occupied the whole of north Asia. The Teutonic races command the greater part of the world's commerce, have done more than any other branch of the human family to establish good government under which life and property are protected and business enterprises are fostered, and have borne the most prominent part in extending civilization and developing natural resources.

Man's Conquest of Nature.—All lower animals collect the food they need, and many of them are also humble manufacturers. The bee makes honey, the spider spins its web, the beaver dams the streams, and many animals build shelters.

In his primitive state, man was much like the lower animals. He collected the necessities of life, and was a manufacturer on a



In 1904, Dr. Supan, of Germany, estimated the total population of the world at about 1,503,300,000, distributed as follows: Asia, 819,556,000; Europe, 392,264,000; Africa, 140,700,000; North America, 105,714,000; South America, 38,482,000; Australia and Polynesia, 6,483,000; Polar Land, 91,000.

small scale. He was able also through his intellectual superiority to fashion rude implements to aid him in his work, and this the lower animals could not do. Animal instinct was the impelling influence that moved man in this primitive stage.

Experience constantly enlightened man. It taught him how to make better implements, and helped him in many ways. One idea that gradually dawned upon him was that if he planted and cared for certain vegetable growths, they would provide him with more and better food than if he depended simply upon wild fruits, grains and roots. He began to till the soil.

Each generation discovered methods for better tillage, found new activities, and invented better methods of doing things. Each bequeathed what it learned to its successors; and so from age to age man benefitted by experience that came down to him from his fathers.

The Era of Scientific Progress.—At last man reached the stage in which he was able to inquire deeply into the secrets of nature, and to make great discoveries and inventions that multiply the comforts and conveniences of life, and the products of human brain and hand. This is the present era of scientific development.

We may briefly consider one phase of this development—that of transportation and communication.

Slow and poor transportation has meant starvation at times, as in China and in the England of the Middle Ages. This is when roads are so poor that people die in one part of a country before grain can reach them from another. There was little commerce between Asia and Europe when boats were afraid to venture out to sea, and only camel trains at Constantinople brought the East and West within touch.

Four hundred years ago only a few ocean vessels had dared to venture far out of sight of land. The sailing-vessel then

The World—showing the United States as its commercial center.

commanded the seas for three centuries until about 1840, when steamships began to supplant them. They travel, on an average, four times as fast as the sailing-vessel.

Columbus's first trip across the Atlantic was made in seventy days. Nearly 300 years later the average time across the ocean was about 42 days; then steamships brought in the era of fast travel. The first steamship crossed the Atlantic from Savannah to Liverpool in 22 days. The time was reduced until to-day the "ocean greyhounds" pass between Sandy Hook and Queenstown in less than six days, providing for their passengers every luxury and convenience.

Ocean transportation became not only fast, but cheap. When iron and steel were substituted for wood in shipbuilding, it became possible to increase the size of steamships; at the same time the cost of forcing them through the water was lessened by the invention of better furnaces, boilers and engines. These improvements lowered the cost of steam power between 1870 and 1900 about 40 per cent. Nearly four times as much steam power is now derived from a pound of coal as in 1860. With greater carrying capacity and much less expenditure per ton for propelling steamships, their owners were able to reduce freight rates.

One of the chief reasons why commodities that once were luxuries are now found in nearly every humble home is because they are distributed so cheaply over the world by present methods of transportation.

Transportation.—As nearly three-fourths of the earth's surface is ocean, most commodities carried from one nation to another go by sea routes. Water transportation is cheaper than land transport, and therefore lakes, rivers and canals are important trade routes in most countries, though they lose some of their importance after the development of adequate railroad

systems. The leading nations spend large sums in the improvement of their waterways. In our country the Mississippi and its tributaries supply over 9,000 miles of navigation. The Hudson River, connected with the Great Lakes by the Erie Canal, has a freight tonnage of over 15,000,000 a year. Large ocean vessels ascend the Delaware to Philadelphia, and this river annually floats about 14,000,000 tons of freight. The coal, lumber, grain and other heavy commodities carried on the Ohio, give it a freight tonnage of 14,000,000 a year. The Mississippi

This map shows the great value of Panama's position to the commerce of the world.

carries about as much freight as the Ohio; and about 10,000,000 passengers are borne from one place to another on steamboats of the Mississippi system every year.

With over three hundred thousand miles of railroad, the United States has a greater length of railways than the whole of Europe, and more than a third of the world's mileage.

Long ocean routes afford the cheapest freight rates. Freight charges are necessarily somewhat higher on large lakes than on the ocean, because lake vessels are smaller and navigation is restricted by small connecting rivers and canals. The actual

cost of transporting freight on railroads is about twice as much as on rivers and canals.

Railroads.—In the United States railroads are only about eighty years old, but this country has a mileage, counting double tracks and switching tracks, that is much greater than the distance from the earth to the moon, and more miles of track than the whole world possessed in 1860. Railroads supply most civilized lands with rapid and comparatively cheap transportation.

The most important railroads are those extending across the continents, east and west. They form parts of transportation lines girdling the earth; and as railroad trains move much more rapidly than steamships and the speed of both has been much accelerated by improved machinery, the time required to travel around the earth has been greatly reduced in recent years.

In 1912 the aggregate length of railroad track in the United States was 359,000 miles; over 65,000 locomotives were required to haul the passenger and freight trains and do the switching; there were over 40,000 passenger cars and 2,355,000 freight cars, and in these cars, during the year, 1,019,658,605 passengers and 1,817,562,049 tons of freight were carried.

In parts of Africa freight is still carried on the backs of men, and there are other regions where ox-teams or pack-mules are the only means of freight carriage. Such transportation is very expensive. The Germans say that the cost of freightage in Africa by ox wagon is twenty times as much as on the Prussian railroads; and that the cost of transport on the backs of men is forty times as much.

We have long known of a cheap way of moving fluid commodities. Water, petroleum oil, and illuminating gas are conveyed long distances in iron pipes. If we did not have this cheap

method of distributing water, it could not be supplied to us at such small cost.

It is quite recently that the wonderful properties of electricity and the methods of best utilizing them were discovered. But to-day, with the aid of hundreds of thousands of miles of electric wire, men in most parts of the world transact business with one another much as though they lived in the same town; and the postal service, a cheaper and slower means of communication, now extends into the heart of Africa and other regions of which we had never heard a quarter of a century ago.

Transportations in Cities and Large Towns.—The enormous growth of cities in area and population has revolutionized their means of transportation because the old omnibus and horse car are too slow and in all respects inadequate to the present demands of business men. Great improvements have been introduced, especially in the United States, where the application of electricity (overhead, underground and third-rail systems) has practically done away with other forms of traction. In 1890 the mileage of the electric lines in the United States was 1,262; in 1910 it had risen to 40,088 miles; while there was a great decrease in the length of lines operated by other forms of power. In 1911 there were in this country 41,028 miles of street and elevated car routes that were operated by electricity.

But surface street-car routes are very limited in speed, for rapid transit is impossible in crowded thoroughfares. Two hours or more are required by the ordinary trolley lines of New York to reach some parts of the city boundary from the great business district at the south end of Manhattan Island. Business men cannot afford this loss of time, and so systems of elevated and underground roads, with electricity for motive power, are now in operation in New York and Boston, elevated roads in Chicago, and plans have been made for the large extension

of these rapid transit roads. The New York Subway Railroad, the largest system of its kind in the world, was opened on October 27, 1904. The part of this system between the Brooklyn Bridge and 96th Street has four tracks, on which express trains run at the rate of 25 miles an hour; and the local trains, stopping at every station, make from 14 to 18 miles an hour. The length of the underground railway system in New York is 26.3 miles. It has 85.2 miles of track. London and Paris also have large systems of underground rapid-transit roads.

Electric Roads between Cities and Towns.—A new development in the United States is electric railroads, called Interurban lines, extending from the cities through many towns, and with numerous stations in the purely farming districts. The cars run at high speed, and some of the trains in Ohio are now provided with sleeping cars for the long-distance routes. There were in 1905 about 8,000 miles of these roads, and Ohio, Michigan, Indiana and Illinois have the most extensive and efficient high-speed rural railroads in the country. Their mileage now exceeds 41,000 miles. These country electric systems are little developed, as yet, west of the Mississippi, owing to the lesser density of population in that section. The rural trolley service is being rapidly introduced in parts of New England, New York, Pennsylvania and all the central States. The trolley freight car is also coming into use, to the advantage of the farmers, whose means of reaching markets are thus greatly increased. As the cost of operation is small, these roads compete successfully with the steam lines, and the development of this system of transportation, it is believed, will be very large. On the other hand, the electrification of the railroad lines is also progressing.

Automobiles.—In recent years gasoline, steam and electricity applied to the propulsion of vehicles on streets and roads have developed, on a very large scale, a new means of trans-

portation. Vehicles thus driven are called automobiles, and hundreds of thousands of them are now in use in the leading countries. They are used not only as pleasure and touring carriages, but also for freight hauling, and to some extent they are taking the place in cities of ordinary freight trucks. Automobile roads have been built in some newly developing countries in advance of the construction of railroads. One of them in Madagascar extended before the construction of the railway from the Indian Ocean to the capital, Tananarivo, about 150 miles in the interior, and automobiles are daily carrying freight and passengers. Two automobile freight roads, one 300 and another 500 miles long, exist in the Belgian Congo. The great usefulness of automobiles has been proven, and vast capital is now invested in their manufacture.

Submarine Boats.—These boats as yet are used only as torpedo boats, their special advantage being that they can approach an enemy's ship under water without being discovered, and launch a torpedo at short range. France has built more of them than any other nation, but they are now a feature of all navies. The boats are submerged by admitting water to the ballast tanks or by using inclined rudders. Both methods are employed in some of the boats. This class of vessels has not yet reached the high mark desired in point of safety, speed and habitability.

Navigating the Air.—In 1766 Henry Cavendish of England discovered the remarkable lightness of hydrogen gas. It was found to be so much lighter than air that bags filled with it would rise far above the earth and float in the atmosphere. This was the germ of the balloon. Balloons have been of little practical importance except for military reconnoissance (captive balloons), and in the case of besieged cities which have sometimes used balloons to communicate with the outer world. In recent years attempts have been made to use them as passenger

carriers. Dirigible balloon lines exist between some large German cities. A balloon simply drifts with the air currents, and it is not natural for man to be long content with devices that he cannot control; so for years many able men have been trying to perfect air-ships which they may steer in any direction and even propel against the wind.

Great progress has been made in these studies, and it is to-day the belief of the most conservative physicists that aerial navigation will be practically accomplished. The investigators are divided into two classes. One seeks to devise means for navigating the air as birds do, which gain support and propulsion solely from mechanical and muscular energy; the other relies for support more or less upon the buoyancy of hydrogen gas, while securing propulsion by means of propellers. All are interested in motors, whether the air-ship moves with or without the support of hydrogen. All are concerned with methods of management and with the adoption of means for directing the movements of an air-ship through the air.

Air-ships are now steered in any direction and propelled against the wind; but there are still problems to be solved to make air navigation useful, safe and not too costly. One of the highest flights on record was that of airman Garros at Houlgate on September 6, 1912, when his airship attained a height of 16,405 feet. These problems are now receiving the closest attention, and when they are solved, the air will become a great navigable highway opened for the nations.

Pneumatic Tubes.—Propelled by air pressure, packages of mail, parcels and other articles are now transported very quickly through tubes. The first extensive application of this method of transportation was made in Berlin in 1865; to-day Berlin has over thirty miles of these tubes in use, and the speed of the "trains" of articles that are shot through the tubes every fifteen

minutes is from 15 to 23 miles an hour. All the leading British and other European cities use this time-saving appliance. The employment of the pneumatic tube for mail and small packages in New York, Philadelphia and many other American cities is constantly increasing.

The Telegraph.—The electric telegraph has been used in business for the quick transmission of communications only since 1846, about twenty years after the introduction of steam railroads. As the telegraph is far less costly than railroad building, it has spread all over the world with much greater rapidity. It has also been laid along the bottom of the sea, from continent to continent, in the form of cable, and thus binds all parts of the world together. Fourteen ocean cables now connect the United States with Europe. Many other cables cross the Atlantic, but it is only recently that cables have been extended across the Pacific between America, Asia and Australia. One of the two Pacific lines extends from Vancouver, B. C., by way of Fanning, Fiji and Norfolk Islands to New Zealand and Australia. The United States line crosses the Pacific from San Francisco through Honolulu, Midway Island, Guam, to the Philippine Islands, touching no land that is not controlled by our country. Altogether 407 different cables have been laid under the oceans. Their total length aggregates 226,591 miles.

Much attention has been given in recent years to wireless telegraphy, various systems of which are in use. They are of much value in communicating between ships at sea and between ships and the shore. Our government maintains wireless telegraph stations at various points along the Atlantic and Pacific seaboards. The ocean cable between Seattle and Valdez, Alaska, is joined with St. Michael by land lines, and St. Michael and the great Nome mining center are connected by wireless telegraphy across Norton Sound, 107 miles. Sometimes 5,000 words are

exchanged in an afternoon between these two points. Trans-Atlantic wireless telegrams between New York and London were first sent in 1911. Wireless communications are now regularly sent clear across the Atlantic and far out in the Pacific ocean. The Federal Telegraph Company owns a commercial system between San Francisco and Honolulu. Wireless telegraphing promises to be one of the very important developments of the next decade for cheap and rapid intercommunication between nations.

The Telephone.—In recent years the telephone has been developed to a high state of perfection. It is one of the most important means of direct, quick and perfect communication between individuals. It is divided into two kinds of service; long-distance and local. The long-distance service is used to a large extent between many people in various cities for the transaction of important business, conversations being held between cities fully 1,500 miles apart, instantly transacting business, when the old methods of letters or travelling would require either much more time or long trips and large comparative expense. Millions of telephones are in use in the United States in what is termed local service in cities and towns, and are connected with the entire surrounding country. They have become so much a part of every-day life that it would be utterly impossible for the ordinary course of business to be conducted without them, and to be deprived of the use of the telephone for a single day would entirely disorganize the routine of business and social relations as they are conducted to-day. The telephone has been a blessing to those living in country districts several miles from smaller towns. Small settlements and plantations in distant islands, widely separated mining districts of Alaska and other isolated countries, stock farm and ranches in the unsettled parts of Africa and South America are now connected by telephone lines. They

are used by armies in the field to keep in communication and advised of different movements. They are also used to report observations in connection with balloons from high altitudes. Progress is also being made in wireless telephones. The general service of the telephone to humanity places it as one of the most convenient and useful of all recent scientific developments.

MATHEMATICAL GEOGRAPHY

Mathematical geography treats of the form and size of tne earth, its dimensions and the methods of ascertaining the position of places on its surface.

The following pages will give many features showing the helpfulness of our Panama Canal Flat-Globe in the study of geography. In the first place, a few definitions and facts of Mathematical Geography will simplify the study.

The Cardinal Points.—If we hang our Globe on the wall, or lay it before us, with the North Pole upward, the right hand on the chart will, of course, represent the east and the left hand the west, the North Pole the North, and the South Pole the south. These are the cardinal points of the compass.

The Antipodes.—A straight line from New York City through the center of the earth to the other side of the Globe would emerge in the Indian Ocean to the southwest of Australia. The point of emergence would be the Antipodes of New York. The line would form a true diameter. Thus the North Pole is exactly antipodal to the South Pole. Antipodes Island, to the southeast of New Zealand, is so called because it is approximately antipodal to Great Britain. Any two places having this relation to each other are exactly 180 degrees of longitude apart; and one of them is just as many degrees of latitude to the north of the equator as the other is to the south of it.

The Flat-Globe shows us that Philadelphia is in 40° north latitude. Its antipodes, therefore, must be in 40° south latitude. This city is also in about 75° west longitude, and as it is separated from its antipodes by 180 degrees of longitude, we find that the antipodes of Philadelphia is approximately in 105° east longitude. Find its position from this explanation on the Panama Canal Flat-Globe.

The Poles.—It is only within a few hundred years that we have accepted the fact that the earth is nearly spherical, and that it revolves around the sun and rotates on its axis. As the earth is spherical, there must be two points on its surface which remain at rest as it rotates. We call these points the North Pole and the South Pole. The imaginary line through the center of the earth uniting them is called the earth's axis.

The Equator.—The circle that surrounds the earth at equal distance from the Poles is called the Equator (equalizer), because it divides the earth into equal hemispheres.

Latitude and Longitude.—It was necessary to devise some means by which we might find any position on the surface of the earth. Mathematicians solved the problem by adopting the expedient of Parallels and Meridians.

Imaginary circles surrounding the earth parallel to the equator are called parallels of latitude. The latitude of a point is its distance from the equator, north or south. Thus, Philadelphia is in about 40^0 north latitude, or, in other words, it stands 2,400 geographical miles north of the equator. The parallels for every 10 degrees of latitude are printed on the Panama Canal Flat Globe.

Meridians are imaginary circles that pass through both poles and intersect the equator and all parallels at right angles. We use these meridians to define the longitude of any point—in other words, to determine its distance to the east or the west of what is known as the prime meridian, and which, of course, must be previously agreed upon. Ptolemy, early in the Christian era, selected Ferro, one of the islands of the Canary group, as the prime meridian, because it was the most western land of which he had any knowledge. It was accepted by all geographers for a long time, but other meridians came into use later, among them Greenwich, Paris, Pulkova and Washington. Most nations now accept Greenwich as the prime meridian.

When the latitude and longitude of a place are given, its geographical position is accurately defined.

Great and Small Circles.—On a terrestrial globe, the circles of latitude are all parallel to the equator, and this is the reason why they are called parallels of latitude. The equator is a Great Circle of the earth. The parallels to the north and south of the equator are, of course, smaller circles, and grow constantly smaller as their distance from the equator increases. They are called Small Circles. All the meridians pass through the poles and are all equal Great Circles of the sphere. For the measurement of degrees of longitude, however, they are treated as half circles extending from pole to pole. On the Flat-Globe, the earth is cut on 20° west longitude and 160° east longitude, which divides the earth into the eastern and western hemispheres. The equator is the dividing line between the northern and southern hemispheres.

Length of Degrees of Longitude.—All our globe calculations have the meridian of Greenwich as the prime meridian. Greenwich is a parliamentary borough of the City of London in Kent County, England, on the Thames, five miles southeast of St. Paul's Cathedral. It is noted for the Royal Observatory (built in 1675). The observatory is in latitude 51° 28′ 38″ north, and is the point of departure through which the prime meridian, or 0, passes from which longitudes are measured. The statute mile is 5,280 feet long. The geographical or nautical mile is 1-60 of a degree of latitude at the equator, and is 7,075 feet long. It is chiefly used by navigators.

The length of a degree of longitude at the equator is 69.164 miles, while at the poles it is nothing. This is because all degrees of longitude converge at the poles, as is seen on the Panama Canal Flat-Globe. As we proceed towards the poles from the equator, the length of the degrees of longitude constantly lessens.

The following table illustrates the length of one degree of longitude in different latitudes from the equator to the poles:

LATITUDE	STAT. MI.	LATITUDE	STAT. MI.	LATITUDE	STAT. MI.	LATITUDE	STAT. MI.
0 degrees	69.164	23 degrees	63.695	46 degrees	48.124	69 degrees	24.860
1 "	69.145	24 "	63.216	47 "	47.253	70 "	23.725
2 "	69.122	25 "	62.718	48 "	46.363	71 "	22.584
3 "	69.072	26 "	62.202	49 "	45.462	72 "	21.437
4 "	68.998	27 "	61.666	50 "	44.545	73 "	20.284
5 "	68.901	28 "	61.113	51 "	43.614	74 "	19.124
6 "	68.785	29 "	60.537	52 "	42.670	75 "	17.957
7 "	68.652	30 "	59.947	53 "	41.713	76 "	16.784
8 "	68.496	31 "	59.333	54 "	40.743	77 "	15.608
9 "	68.315	32 "	58.711	55 "	39.760	78 "	14.427
10 "	68.117	33 "	58.065	56 "	38.765	79 "	13.240
11 "	67.900	34 "	57.397	57 "	37.758	80 "	12.049
12 "	67.661	35 "	56.714	58 "	36.740	81 "	10.854
13 "	67.402	36 "	56.018	59 "	35.711	82 "	9.656
14 "	67.121	37 "	55.308	60 "	34.669	83 "	8.456
15 "	66.821	38 "	54.570	61 "	33.617	84 "	7.253
16 "	66.499	39 "	53.819	62 "	32.555	85 "	6.048
17 "	66.163	40 "	53.053	63 "	31.483	86 "	4.840
18 "	65.798	41 "	52.269	64 "	30.402	87 "	3.631
19 "	65.419	42 "	51.476	65 "	29.310	88 "	2.421
20 "	65.014	43 "	50.660	66 "	28.210	89 "	1.211
21 "	64.589	44 "	49.830	67 "	27.101	90 "	0.000
22 "	64.156	45 "	48.982	68 "	25.985		

In computing distance from one point to another on the earth's surface, it will be necessary to make some allowances where the points lie north and south of each other, but on direct parallels east or west the scale in the table above gives the number of miles at each parallel.

Change of Date Line.—The change of date line marks the change of day in circumnavigating the earth east or west. By common consent of the leading nations, it is placed in the Pacific, and for the most part coincides with the 180th meridian. When ships "cross the line," they add a day to their calendar if they are going west, and subtract a day if they are going east; and the date line is placed in the Pacific, far from most lands, because it is best to have the change made where it will be least inconvenient. Because we have the western date, the date line

diverges from the 180th meridian in the Aleutian Archipelago, so as to give all our Aleutian islands the western day. At about 15° North of the equator the line extends to the east so as to include Samoa and Fiji as well as New Zealand in the Asiatic group. It is then prolonged diagonally to join the 180th meridian again. United States and French possessions are thus left east of the line.

SOME FEATURES OF THE PANAMA CANAL FLAT-GLOBE

Highways of the Seas.—You will notice on our Flat-Globe that the principal ocean highways are given, and the distance in miles between ports is shown. Thus, from San Francisco to Honolulu is 2,100 miles, from Honolulu to Manila, Philippine Islands, is 4,700 miles; by following these lines from one hemisphere to the other, we get a perfect globe effect, as you will notice the same degree of latitude in one hemisphere corresponds to the same degree of latitude in the other, which brings all lines of latitude and longitude correctly in place.

To show how vessels sail around the world, follow the line from New York City across the Atlantic, pass the Azores Islands to Gibraltar, through the Mediterranean Sea, Suez Canal, Red Sea, Gulf of Aden, across the Arabian Sea to Ceylon, then through the Indian Ocean to Australia, on to Melbourne and New Zealand, then across the South Pacific Ocean through the Panama Canal, and thence northward through the North Atlantic Ocean to New York City.

The Zones are situated within fixed circles on each hemisphere, and they are imaginary belts, or girdles, named as follows: Torrid, meaning hot; Frigid, meaning cold or frozen; Temperate, meaning moderate. There are five in all. The Torrid Zone is situated between the Tropic of Capricorn, which is a

dotted line 23½ degrees south of the equator, and the Tropic of Cancer, which is a dotted line 23½ degrees north of the equator.

The Polar Circles are illustrated by dotted lines 23½ degrees from the Poles. The northern is called the Arctic Circle, and the southern is called the Antarctic Circle. Each circle of latitude on the Globe represents 360 degrees of longitude, varying in length.

From the Tropic of Cancer north to the Arctic Circle is the North Temperate Zone. From the Arctic Circle to the North Pole is the North Frigid Zone.

From the Tropic of Capricorn, south latitude, to the Antarctic Circle, is the South Temperate Zone, and from the Antarctic Circle south to the South Pole is the South Frigid Zone.

Small dotted lines illustrate the limits of ordinary navigation toward the Poles, and the limits of the heavy drift ice, also the coral reefs and islands. The various routes of hurricanes, trade winds, and sea currents, showing their course, are distinctly traced.

The youngest student of geography may learn quickly to use this Flat-Globe in an intelligent manner.

By being placed together, back to back, the hemispheres make two pole points, one for the north and one for the south; they are joined correctly and give the globe effect, and are more easily understood by the child or any person studying from it than from a solid ball globe.

Time.—Time is measured by the rotation of the earth on its axis. The difference of longitude between any two places on the earth's surface is simply the difference of local times at the two places at the same instant. We are thus able to convert differences of time into differences of longitude, or vice versa. When it is noon on the prime meridian at Greenwich, for example, it is earlier for places to the west of Greenwich by the amount of

one hour for every 15 degrees of west longitude; and, similarly, it is later for all places to the east of Greenwich.

Thus the surface of the earth may be divided into spaces by meridians fifteen degrees apart, beginning with Greenwich. These meridians may be called hour-circles. The first three of them west of Greenwich are in the Atlantic Ocean, the fourth (60 degrees) passes through Labrador and the Gulf of St. Lawrence, the fifth (75 degrees) is near Philadelphia, the sixth (90 degrees) is near St. Louis, the seventh (105 degrees) is near Denver, and the eighth (120 degrees) is the west boundary of Nevada.

From these meridians, or hour-circles, "standard" railroad time in North America is now taken, each company adopting the time of the hour-circle nearest the greater portion of its road. The names applied to these standards are International (on the 60th degree), Eastern (on the 75th degree), Central (on the 90th degree), Mountain, (on the 105th degree) Pacific (on the 120th degree).

All places on the same meridian have exactly the same time. On the meridian of 75^0 west near Philadelphia, for example, it is noon at the same instant from the north to the south pole.

The degrees of latitude and longitude and their subdivisions are thus designated: A degree (^{0}); a minute, or the sixtieth part of a degree ($'$); a second, or the sixtieth part of a minute ($''$).

TABLES SHOWING RELATIONSHIP OF LONGITUDE TO TIME

360°	of longitude	make	a difference of	24 hours in time.
15°	"	"	"	1 hour in time.
1°	"	makes	"	4 minutes in time.
1′	"	"	"	4 seconds in time.
1″	"	"	"	1-15 second in time.

60″ = 1′	60 seconds = 1 minute.
60′ = 1°	60 minutes = 1 hour.
30° = 1 S.	24 hours = 1 day.
360° = 1 Cir.	365 d., 5 h., 48 m., 49 s. = 1 solar year

Time Around the World.— You will notice at the Equator on the Flat-Globe there are shown twenty-four clock faces, one

for every hour of the day. When it is twelve o'clock, noon at Greenwich, or degree "0", at fifteen degrees east of that point it is one o'clock p.m., and at fifteen degrees west, it is eleven o'clock a.m., and for every additional fifteen degrees of distance, east or west of Greenwich, to the 180th parallel, or date line, where it is midnight, there is a difference of one hour in time. East of Greenwich it is p.m., west of Greenwich it is a. m. For example: to find the time of day at any point, say, from St. Louis, Missouri. If it is twelve o'clock, noon, at St. Louis, bear in mind that it is later to the right hand, or east, and earlier to the left hand, or west. You can readily reckon the time from any point, by obtaining the parallel of longitude, and following your dials therefrom, allowing one hour for each fifteen degrees.

Divisions of Time.—The apparent movement of the sun and the movement of the moon have been taken in all ages and in all countries as the measure of time. The diurnal motion of the earth constitutes the measure of our day, the earth's revolution on her orbit the measure of our year, and the periodic return of the moon is the basis of our month.

The true solar year contains 365 days, 5 hours, 48 minutes and 49 seconds, but as the common or civil year consists of only 365 days, the Solar year is about a quarter of a day longer than the civil year, and therefor, as this year always contains 365 days, there would be an error of a day in the course of every four years. In order to correct that error, Julius Caesar enacted that every fourth year should consist of 366 days, this being called leap year, and the additional day to be added in the month of February, thereby making that month contain twenty-nine days once in four years. Hence this mode of reckoning is called the "Julian Calendar."

If the solar year had consisted of 365 days, 6 hours, exactly, there would have been no need of making further correction;

but it is over eleven minutes too short, and in consequence the Julian Calendar introduced an error of forty-four minutes every four years, or about a whole day in one hundred and thirty years, which in the course of centuries became considerable, and so it happened that in 1577 the Vernal Equinox occurred on the 10th of March instead of the 21st. Pope Gregory, in the year 1582, corrected the calendar in the following manner: The 5th of October should be called the 15th to correct the error which had occurred from the time of Caesar, and to prevent its happening again, he decreed that every fourth year should be leap year, as in the Julian Calendar, except that every hundredth year for three consecutive centuries should be common years, and the fourth hundredth should be leap year. Thus 1700, 1800, and 1900 are common years, and 2000 is a leap year. By this mode of reckoning, the error in four hundred years would not exceed one day. This calendar, the Gregorian, was not adopted in Great Britain till 1752. It is called the New Style, to distinguish it from the Julian Calendar, which is called the Old Style.

Equation of Time.—Owing to certain causes, among them the irregularity of the sun's apparent motion among the stars, we find that the interval between two successive noons is not always the same, and a clock that keeps true time will not, therefore, always correspond with the sun; for example, if it be twelve o'clock m. by a clock keeping true time, when the sun is exactly on the meridian, it will not be exactly noon by the clock to-morrow when the sun reaches the same meridian. The time by the clock will be either a little before or behind that of the sun, according to the season of the year. This difference between the clock and the sun is called the Equation of Time. You will find in almost every almanac, for each month, reference for this difference in time for each day in the year. Thus you

can always tell how much before or after solar time your watch or clock is.

Length of Days at Various Latitudes.—The following table illustrates the length of the longest days in the various latitudes from the equator:

Latitude at	0	degrees,	the	longest	day	is 12	hours.
"	30	"	"	"	"	14	"
"	49	"	"	"	"	16	"
"	58	"	"	"	"	18	"
"	63	"	"	"	"	20	"
"	65	"	"	"	"	22	"
"	66	"	"	"	"	24	"
"	67	"	"	"	"	1	month.
"	69	"	"	"	"	2	months.
"	90	"	"	"	"	6	"

To Find the Latitudes and Longitudes of Places.—To find the latitude of any place, find the parallel nearest to the place, and follow it to the right or left margin of the map, and approximate distance above or below the line, as the Panama Flat-Globe shows a line at every ten degrees; remember that if north of the equator, it is in north latitude, and if south of the equator, it is in south latitude.

To find the longitude of any place, start from the equator on a parallel nearest to that point and approximate the degrees in longitude from the figures that show at a distance of five degrees on the equator, bearing in mind that the places to the right or east of the meridian of Greenwich to the 180th degree or date line are in east longitude and those to the left of Greenwich to the 180th degree or date line are in west longitude.

Here are a number of examples of the kind of questions that may be answered by reference to the Flat-Globe:

Example—Some shipwrecked sailors who are out of sight of land find by the sun that they are in 40 degrees north latitude and 30 degrees west longitude. What is their place on the globe, what land is nearest them, and in what direction must they sail to reach it?

Answer—The Island of Flores, almost due south.

Example—Another company are in 30 degrees south latitude and 110 degrees west longitude. What land is nearest them, and in what direction must they sail to reach it?

Answer—Easter Island, or almost due north.

Example—What hour is it at London when it is noon at St. Louis?

Answer—London being 90 degrees east of St. Louis, makes it six hours later there. Hence it is 6 p. m. at London.

What hour is it at Chicago when it is 9 a. m. at New York?

Example—To find the difference in longitude between any two places whose difference in time is known:

Reckon fifteen degrees of longitude for every hour of time and one degree for every four minutes. If the time is later the longitude is east, and if earlier it is west. It is in this way that sailors find where they are on the ocean.

Example—Some sailors at noon on the 21st of December saw the sun to the south and only ten degrees above the horizon. In what latitude were they?

Answer—50° 30′ north latitude.

Example—By their chronometer, which keeps Greenwich time, it is three o'clock p. m.; in what longitude are they and where are they on the globe?

Answer—Longitude 45° west and in the Atlantic Ocean, 3° 3′, or 243 miles south of Cape Farewell in Greenland.

Example—To find the length of a degree of longitude at any given latitude:

Measure the distance between any two meridians at the given latitude with a rule and ascertain the number of degrees to the inch this occupies at the equator. Multiply this number of equatorial degrees by 69 1-6 and you have the number of miles between the two meridians, which, divided by the number of degrees between them, will give you the number of miles in one degree.

Example—To find how fast per hour the people at any given place are carried from west to east by the rotation of the earth on its axis:

Find the number of miles in fifteen degrees of longitude at the latitude of the given place and multiply this by 69 1-6, which will give the distance the place moves per hour.

Example—How far does a point on the earth move from west to east in one hour at latitude 30 north?

Answer—The distance between two meridians (fifteen degrees) at latitude 30 degrees is equal to thirteen degrees on the equator, which, multiplied by 69 1-6 miles in each degree, gives 899 miles as the distance traveled in one hour.

Example—To find the antipodes of any place:

Ascertain the latitude and longitude of the given place, and on the meridian exactly opposite from it locate a place the same distance on the opposite side of the equator, which will be the antipodes of the given place.

Approximate Ocean Distances.—A knot or nautical mile is 6,086 feet; a statute or English land mile is 5,280 feet; a knot is therefore equal to about one and fifteen one-hundredths statute miles.

New York Sandy Hook to	Knots	New York Sandy Hook to	Knots
Alexandria	4,988	Hamburg	3,510
Algiers	3,564	Havre	3,094
Amsterdam	3,335	Liverpool	3,032
Antwerp	3,208	Lizard	2,934
Azores	2,250	London	3,222
Bermuda	691	Marseilles	3,900
Bremen	3,484	Milford Haven	2,875
Cherbourg	3,027	Naples	4,140
Christiania	3,425	Newfoundland, Banks of	960
Copenhagen	3,800	Plymouth,	2,946
Dover	3,160	Prawle Point	2,959
Fastnet	2,800	Queenstown, Roche Point	2,772
Genoa	4,060	Rotterdam	3,290
Gibraltar	3,200	Scilly, Bishop Rock	2,886
Glasgow	2,950	Southampton	3,100

	Knots.
New York to Sandy Hook	18
Sandy Hook to Sandy Hook Lightship	8
Sandy Hook Lightship to Fire Island	30
Fire Island to Shinnecock	35
Shinnecock to Nantucket Lightship	122
Baltimore to Hamburg (Cuxhaven)	3,813
Baltimore to Southampton	3,405
Baltimore to Queenstown (Roche Point)	3,118
Philadelphia to Hamburg (Cuxhaven)	3,633
Philadelphia to Southampton	3,223
Philadelphia to Queenstown (Roche Point)	2,950
Boston to Hamburg (Cuxhaven)	3,278
Boston to Southampton	2,868
Boston to Queenstown (Roche Point)	2,581

On a clear day two steamers approaching each other on parallel lines at 20 knots speed will pass at the end of fifteen minutes after their hulls first become visible to the naked eye, and at the end of another fifteen minutes will have passed out of sight astern.

Depths of the Oceans.—The average depth of the oceans is 11,470 feet. The greatest known depth is 32,114 feet. The extent and depth of the several oceans are approximately as follows:

	AREA SQUARE MILES	AVERAGE DEPTH
Pacific	68 million	12,780 feet.
Atlantic	34 million	12,060 feet.
Indian	28 million	10,980 feet.
Antarctic	6 million	6,000 feet.
Arctic	6 million	5,100 feet.

UNITED STATES "PORTS OF ENTRY"

Albany, N. Y.,	Evansville, Ind.,	New Orleans, La.,	San Francisco, Cal.,
Atlanta, Ga.,	Galveston, Tex.,	Newport News, Va.,	Savannah, Ga.,
Baltimore, Md.,	Grand Rapids, Mich.,	New York, N. Y.,	St. Joseph, Mo.,
Bath, Me.,	Hartford, Conn.,	Norfolk, Va.,	St. Louis, Mo.,
Boston, Mass.,	Indianapolis, Ind.,	Oakland, Cal.,	St. Paul, Minn.,
Bridgeport, Conn.,	Jacksonville, Fla.,	Omaha, Neb.,	Sault Ste. Marie, Mich.,
Buffalo, N. Y.,	Kansas City, Mo.,	Philadelphia, Pa.,	
Burlington, Vt.,	Key West, Fla.,	Pittsburg, Pa.,	San Antonio, Tex.,
Charleston, S. C.,	Lincoln, Neb.,	Port Huron, Mich.,	Seattle, Wash.,
Chicago, Ill.,	Louisville, Ky.,	Portland, Me.,	Sioux City, Ia.,
Cincinnati, O.,	Memphis, Tenn.,	Portland, Ore.,	Springfield, Mass.,
Cleveland, O.,	Middletown, Conn.,	Pt. Townsend, Wash.,	Tacoma, Wash.,
Columbus, O.,	Milwaukee, Wis.,	Portsmouth, N. H.,	Tampa, Fla.,
Denver, Colo.,	Minneapolis, Minn.,	Providence, R. I.,	Toledo, O.,
Detroit, Mich.,	Mobile, Ala.,	Richmond, Va.,	Washington, D. C.,
Dubuque, Ia.,	Nashville, Tenn.,	Rochester, N. Y.,	Wilmington, Del.,
Duluth, Minn.,	Newark, N. J.,	San Diego, Cal.,	Wilmington, N. C.
Enfield, Conn.,	New Haven, Conn.,	Sandusky, O.,	

DISTANCES IN NAUTICAL MILES

Saved from New York via the Panama Canal on Trade Routes

San Francisco:	
Magellan	13,135
Panama	5,262
Saved	7,873
Guayaquil:	
Magellan	10,215
Panama	2,810
Saved	7,405
Callao:	
Magellan	9,613
Panama	3,363
Saved	6,250
Iquique:	
Magellan	9,143
Panama	4,004
Saved	5,139
Valparaiso:	
Magellan	8,380
Panama	4,633
Saved	3,747
Honolulu:	
Magellan	13,312
Panama	6,700
Saved	6,612
Manila:	
Suez	11,589
*Panama	11,548
Saved	41
Yokohama:	
Suez	13,079
*Panama	9,798
Saved	3,281
Hongkong:	
Suez	11,628
*Panama	11,383
Saved	245
Melbourne:	
Magellan	12,852
Panama	10,030
Saved	2,822

*Via San Francisco and the Great Circle.

DISTANCES AND MAIL TIME FROM NEW YORK CITY

BY POSTAL ROUTE TO—	MILES.	DAYS.
Adelaide, *via* San Francisco	12,845	31
Alexandria, *via* London	6,150	10
Amsterdam, " "	3,985	7
Antwerp, " "	3,208	7
Athens, " "	5,655	10
Bangkok, Siam, *via* San Francisco	12,990	43
Batavia, Java, *via* London	12,800	32
Berlin	4,385	6
Bombay, *via* London	9,765	22
Bremen	4,235	6
Calcutta, *via* London	11,120	29
Cape Town, *via* London	11,245	25
Constantinople	5,810	10
Florence, *via* London	4,800	9
Glasgow	3,375	8
Hamburg, *via* London	4,340	8
Hong Kong, *via* San Francisco	10,590	27
Honolulu " " "	5,645	12
Liverpool	3,540	7
London	3,740	6
Madrid, *via* London	4,925	9
Melbourne, *via* San Francisco	12,265	30
Mexico City (overland)	3,750	5
Paris	4,020	7
Rome, *via* London	5,030	9
Rotterdam	3,935	8
St. Petersburg	5,370	9
Shanghai, *via* Vancouver	9,920	25
Stockholm, *via* London	4,975	10
Sydney, *via* San Francisco	11,570	31
Vienna	4,740	8
Yokohama, *via* San Francisco	7,348	20

National and Political Geography

Following are the most important and the latest facts concerning the various countries of the world:

Abyssinia (or **Ethiopia**).—A native empire (despotic) in East Africa, between 4° and 15° north latitude and 35° and 47° east longitude. A rugged plateau mostly, 8,000 feet above the level of the sea. In the center of the country is a great depression, occupied by Lake Tsana, with an area of 1,200 miles, which is the principal source of the Blue Nile. Population, about 7,000,000; area, about 250,000 square miles. The late emperor, Menelik II., claimed his descent from Menelik, the son of Solomon by the Queen of Sheba.

The chief commercial products are coffee, wild indigo, cotton, sugar-cane and dates. The country has many valuable forest trees. The capital is Addis Abeba; population, about 50,000. Other towns—Harar, 35,000; Ankober, 7,000; Axum, 5,000; Gondar, 5,000.

The country is almost exclusively agricultural, but tillage is very inadequate. The higher plateaus are adapted for European cereals. The western lowlands are hot and unhealthful. An important coffee-growing country. Industries are very little developed. Mules and donkeys chiefly used for transportation. The French railroad from Jibuti extends to Harar and Addis Abeba. Religion, Christian (Coptic). Exports (1911)—$2,724-965, coffee, dates, ivory, gums, skins; imports estimated, $2,500-000, cotton goods, cutlery, etc.

Afghanistan.—A despotic emirate in south-central Asia; lies between Persia and India. Area, 250,000 square miles; population, 4,500,000; Kabul, the capital, has 140,000 population; Kandahar, 40,000; Herat, 12,000; Ghazni, 5,000. It is

one of the most barren countries in the world. Sand, bare rocks, sterile hills, and vast snow-capped mountains are the main features of this stern, inhospitable country. In summer it is hot everywhere. The temperature depends upon the elevation and not upon the latitude. Stony, treeless slopes, parched soil, and whirling sand increase the heat and dryness of the scorching air. Winter brings frost, snow and blustering storms, and is full of surprises. One moment a traveler may be in the sun's glare and the next he is pierced by the icy wind. The products are wheat, barley, rice, millet and Indian corn. Assafoetida in large quantities is exported from this country to India. Fruits, such as figs, pomegranates and almonds, are produced in large quantities. The Bactrian camel, sheep and goats are reared. The industries are excellent felts and carpets of wool and hair, and some silk is produced. Race, Afghan—exclusive and unfriendly to foreigners. Religion, Mohammedan. There is small exterior commerce, but some machinery has been imported into Kabul, and fire-arms are manufactured there. Foreign trade, chiefly with India (1912) estimated—exports, $5,500,000; imports, $4,500,000.

Alaska.—Area, 590,884 square miles; population (1910), 64,356; between 52° and 72° north latitude and 141° and 170° west longitude. Principal towns: Fairbanks, population (1910), 3,500; Nome, 2,500; Skagway, 1,800. This vast territory, including the Aleutian Islands, came into the possession of the United States by purchase from Russia in 1867, at a cost of $7,200,000 in gold. Congress created Alaska a civil and territorial government May 17, 1884. At the time of its purchase from Russia it was considered a great folly (Seward's folly). The territory has far more than paid for itself to date, and is one of the most valuable of countries in its resources in seal and other fur-bearing animals, minerals, fisheries and timber. It has vast lumber

districts in its southern parts. The National Forests have an area of 26,761,626 acres. Its coast line is over 18,000 miles, or more than that of all the United States proper. There are 61 volcanoes, 10 of which are active. Alaska is one of the greatest glacier regions on the globe. There are numerous hot mineral and boiling springs. Medicinal springs abound. Its great rivers, the Yukon and the Kuskokwim are navigable for upwards of 3,000 miles.

Since 1896 the development of placer mining, which supplies most of Alaska's gold output, has made wonderful progress. The yield increased from $2,500,000 in 1897 to about $20,072,420 in 1911, more than half of it coming from the Seward peninsula (Nome and other centers). The placers of the Tanana, Copper and Koyukuk Rivers and Porcupine Creek are conspicuous for their yield. The gold production of 1911 was 806,179 ounces valued at $16,665,200. Copper has been discovered in the Copper River, upper Tanana, and other districts. Coal is mined along the Yukon. Valuable coal fields have been discovered in the Matanuska and Bering fields. Tin has been found near Cape Prince of Wales, and petroleum fields have been investigated along the coasts. In a few districts much hay and a good variety of field crops may be raised. Reindeer for draft and meat purposes are multiplying. A cable from Seattle connects the most important coast towns with the United States, and a system of internal telegraphs is in operation.

Algeria.—The most important colony of France, situated on the Mediterranean coast of Africa. Area with the Sahara, 327,000 square miles. Population in 1911, 5,563,000, of whom 700,000 are foreigners, 400,000 French. Capital, Algiers, 172,000, Oran, 123,000; Constantine, 65,000. Occupied by France in 1830. Climate resembles that of southern Italy. The coast is divided into several long strips by the parallel chains of the Great and

Lesser Atlas—*viz.*, the coast plain only partially arable; the Tell, the chief agricultural and stock-farming region; and the Algerian Sahara, with fertile oases. The chief crops are grain, wine, oil, tobacco, dates and southern fruits. Large quantities of vegetables are raised for the markets of France. Cork and esparto grass for paper making are exported. Horses, camels and sheep are of superior quality. The country is extraordinarily rich in phosphates, and yields iron, copper, lead and salt. The Arab natives make carpets and their other distinctive wares. The French have few manufactures. Wagon roads are fine, and nearly three times the length of the railroads, which have made rapid progress. Races—Berber, French, Italians, etc. Religions—Mohammedan, Christian, and Jewish. Foreign trade (1912) almost wholly with France—exports, $103,965,000; imports, $131,010,000.

Andorra.—A republic in the Pyrenees. Area, 176 square miles; population, 5,231. Situated about 42° north latitude and 2° east longitude. Before the French revolution this valley, high among the mountains, had no sovereign rights, but was a barony of the Counts of Urgel and of Aragon, having governmental relations both with France and Spain. In 1793 the French Republic declined to receive the customary tribute, in 1810 the Spanish Cortes abolished the feudal régime, and thus Andorra became an independent state. The inhabitants continue to govern themselves in accordance with old feudal customs. The land belongs to a few families. Cattle breeding and a little iron and woolen manufacturing are the chief industries. The village of Andorra is the capital, but San Julia de Loria is a more important place. Race, chiefly Spanish. No trade statistics.

Angola.—A Portuguese colony on the west coast of Africa between 6° and 18° S. Lat. Area, 435,000 sq. miles; population,

3,800,000. The agricultural products are sugar, cotton, coffee, rubber, palm oil and sisal. The Port of Loanda is the capital; population (1911) 17,541. A railroad extends from this city to Malange. Thence it is projected towards the Belgian Congo. Benguela and Mossamedes, population (1911) 4,000 and 3,000 respectively, are other railroad terminals on the Atlantic. Trade in 1912 (mainly with Portugal). Imports, $2,000,000; exports, $1,800,000.

Arabia.—A peninsula and part of the Turkish Empire, between 13° and 33° north latitude and 35° and 60° east longitude. Area, 1,170,000 sq. miles; population, 8,500,000. Mecca, the capital; population, 60,000. It is surrounded on three sides by seas, is an extensive desert land, interspersed with a few fertile spots on the coasts, and oases in the interior, where millet, cotton, coffee, indigo, barley, sugar, dates, tobacco and aromatic plants are raised. Some of the inhabitants dwell in towns and till the soil. Commonly they are Bedouins, or wandering tribes, whose wealth consists of horses, camels, asses and mules, for which the country is noted. In all this vast country there is scarcely a single stream deserving the title of river. Mecca, the birthplace of Mohammed, derives its support entirely from the thousands of pilgrims that travel thither from every part of the Mohammedan world. Many also visit Medina, his burial-place. It is on the slopes of Yemen, on the southwest coast, that the famous Mocha coffee is raised; but owing to primitive methods, the production has become very small. Only in the mountainous southwest has a fixed population established itself. Race, Arabian, divided into many tribes. Religion, Mohammedan. Foreign trade small. The railroad from Damascus to Mecca has reached Medina.

Argentine Republic.—South America, between 22° and 53° south latitude and 56° and 72° west longitude. The third largest

of the American Republics. Area, 1,135,840 square miles; population (1911), 7,500,000; capital, Buenos Aires, 1,329,697; Rosario, 201,268. This country is the richest and most prosperous in South America. Climate chiefly temperate. Twenty years ago only a cattle-raising country, Argentine has become largely agricultural. Over 45,000 square miles under crop. Most of it is pampas or comparatively flat plains. The eastern part of the pampas and the region between the Parana and Uruguay rivers are most important for farming. Wheat production in 1910 was 3,700,000 tons. Much wheat is exported. Maize and linseed are very large crops. Animal raising is very extensive, chiefly cattle and sheep. The large resources in minerals near the western mountains are still almost undeveloped. Manufacturing is small, but growing. The Parana, Paraguay and Uruguay rivers are splendid highways of trade. Railroads crossing the grain regions are pushing towards the Andes, and the transcontinental railroad has reached the Chilean frontier. Races—Spanish-American, Italian, German, and Indian. Religion, Roman Catholic. Foreign trade 1911—exports, $314,957,000, chiefly frozen meats, live cattle, wool, wheat, linseed, hides; imports, $335,806,365, chiefly textiles, iron machinery, etc.

The Commonwealth of Australia.—A self-governing colony of Great Britain. The smallest of the continents between 11° and 44° south latitude and 112° and 152° east longitude. Its states are New South Wales, South Australia, Queensland, Western Australia, Victoria, Tasmania. Area, 2,972,906 square miles. Population (1911), 4,455,000. Temporary capital, Melbourne. Canberra has been selected as the site of its permanent capital. Melbourne and Sydney each has a population of about 500,000. Australia resembles Africa in surface features—a high plain in the interior, with mountains in the east and west, and

whom are farmers. Cattle and sheep-herding are important; iron and coal are the chief minerals; military service is obligatory; less than 29 per cent. of the population can read or write. It has a large trade in manufactured articles, and 507 miles of railroad in operation. Freed from the Turkish yoke in 1878, many schools have been established, much progress made in all directions, and manufacturing is more advanced than in most Balkan States, especially in footwear, leather-making, woolen textiles and carpets. Races—two-thirds Bulgarians, one-seventh Turks, Rumanians, Greeks, etc. Religion, chiefly Greek Church. Foreign trade (1911)—imports, $39,470,000; exports, $36,926,800.

Cape Colony.—A British colony in South Africa, now part of the Union of South Africa. Area, 276,902 square miles; population, (1911) 2,564,965. Chief cities: Cape Town, population, 78,000; Kimberley, 34,500; Port Elizabeth, 33,000. It extends between 28^0 and 35^0 south latitude and 16^0 and 30^0 east longitude. A large portion of the country is but a wide area of semi-arid regions, which have nutritious grasses that support millions of sheep and cattle and many ostriches. Stretching across the southern edge of Cape Colony is a zone of excellent lands producing wheat, maize and other crops of the temperate zone. Thousands of acres are in vines, the colony being a large producer of wine, and also of north and south European fruits, of which large quantities are sent in cool storage to Europe as early as February and March. Four-fifths of Cape Colony needs artificial irrigation, and plants for this purpose are developing. The autumn rains provide much water. Wool-growing is the largest grazing industry, and ostrich feathers from the domesticated birds are derived chiefly from this region. Goats are more numerous than cattle, the Angora goat yielding large quantities of mohair. The

diamond mines at Kimberley practically monopolize the world's trade. Efforts to develop industries since the Boer war are noteworthy, but wine-making is still the most important branch. The ports of Cape Town, East London and Port Elizabeth are connected with the far interior by rail, and trains are now running from Cape Town to Victoria Falls, on the Zambesi River, 1,640 miles. Races—British, Dutch, and the natives, who outnumber the whites about six to one. Religion, Protestant. Trade in 1911—exports, $185,120,000; imports, $181,117,695.

China.—A Republic. Area, 4,278,591 square miles; population (1911) 439,500,000, of which 407,737,305 in China proper. Peking is the capital; population, estimated at 692,850 by the Chinese census of 1911. China extends between 18° and 54° north latitude and 74° and 134° east longitude, and contains over one-fourth the population of the earth. Its civilization, arts and culture are the oldest in the world, and for centuries have been practically unchanged. It was the last of the Eastern nations, to open its ports to the world. The present outlook for more rapid internal improvements is encouraging. Railroads are being built. The line from the Yangtze to Peking is 755 miles long. The one from Pukow to Tientsin is 626 miles. Western methods of manufacturing cotton and some machinery are being introduced. Its dense population makes necessary rigid economy. Its rivers and many canals are of great importance for transportation in the absence of railroads. Its largest cities stand on their banks, while many thousands of people live in boats which float on their surface. Tibet is high, cold and barren, excepting in some of the lower lands in the south. Manchuria has fine and well-tilled agricultural lands in the south, raising large crops of wheat, beans and other produce. It is the most valuable part of the empire outside of China proper. Rice forms the principal food of China; fish comes next. Domestic

animals, excepting hogs and poultry, are of subordinate importance. Ninety per cent. of the people are engaged in agriculture. Tillage of the soil is most extensive. Each family has only a half acre to two acres, and the hoe takes the place of the plow. The north of China resembles our Northern States and the south the Gulf States in vegetation and crops. The country is very rich in minerals, especially coal and iron, but mining methods are primitive, and the output is small. Religions—Confucianism, Buddhism, Taoism, Mohammedan; 1,094,000 Roman Catholics, 35,000 Protestants. Foreign trade (1911)—imports, $317,405,650; exports, $254,015,405.

Chile.—A South American republic. Area, 299,626 square miles; population (1910), 3,415,060; extends between 17° and 55° south latitude and 68° and 75° west longitude. Chileans are progressive people, encouraging manufactures and providing good educational facilities. Santiago is the capital; population, 335,000; Valparaiso, leading port on the Pacific coast of South America, 144,000; Concepcion, 50,000; Iquique, 42,788. The country lies west of the Andes Mountains—extending from Peru on the north to Cape Horn, a distance of 2,500 miles. The elevation of its eastern boundry, the Andes range, is from 13,000 to 14,000 feet above the sea level; many of its peaks rise higher. The greater part of the coast is studded with islands, some of which are very fertile. The north is sultry and rainless (desert of Atacama); the center has regular winter rains, and the south has superabundant rainfall (120 inches) and a cool temperature. Agriculture is possible in the north only by irrigation in a few river valleys; in central Chile, between Santiago and Valdivia, our cereals thrive finely. Here also tobacco and the grape are cultivated (50,000 men in the wine industry). The central farming region sends foodstuffs to north Chile. Forests predominate in the south, but are as yet little utilized. Stock

raising, chiefly sheep, is not extensive. Mining supplies 92 per cent. of the total exports. Over 1,000,000 tons of nitrate of soda are sent abroad for fertilizers every year. Copper is the largest metal export, followed by silver and gold. Manufacturing in many respects is still in its early stages, though Chile is first in South America in these industries, chiefly flour mills, foundries, tanneries, spinning and weaving mills, potteries and metal goods. As there is little interior navigation, railroads are of great importance and fairly well developed. Over 4,000 miles are in operation. Steamers ply the coast trade. Races—Spanish-American, German and Indian. Religion, Roman Catholic. Foreign trade (1911)—imports, $127,381,500; exports, $123,488,420.

Colombia.—A South American republic. Area, 486,827 square miles; population, (1912), 5,475,961, extends between 67° and 79° west longitude and 12° north and 4° south latitude. Low plains and valleys in the north give abundant pasturage to cattle. South of Caribbean coast-lands the Cordilleras cover about one-third of the state, and high plateaus among them yield wheat and other temperate crops. Rainfall is very heavy on the narrow Pacific slope, which is covered with dense tropical vegetation. East of the Cordilleras is a wide expanse of selvas (forested plains), rich in rubber, also llanos, or grass plains, where cattle graze. Coffee of good quality is cultivated at middle altitudes. The great differences in altitude give Colombia all the climates and a large variety of the vegetable products of the world. In the coastal low grounds and river valleys the products are purely tropical; between 3,000 and 6,500 feet, maize and coffee predominate; between 6,500 and 10,000 feet, the climate is delightful, and wheat, vegetables and Northern fruits are cultivated. Colombia is the source of the world's supply of emeralds, but the mining of gold, silver and coal and other important minerals is

little developed. The population live chiefly on the high plateaus and at the seaports. Few countries are so poorly provided with means of transportation. There are about 400 miles of railroad, almost no wagon roads, and only poor mule paths. The Magdalena River is navigable nearly to Honda, 600 miles, the Cauca to Caceres, and the Atrato to Quibdo; but the most populous regions among the highlands are reached only by mule trains. The coast towns import wheat more cheaply than they can bring it from their own highlands, The few industries are centered around Bogota, the capital; population, 120,000; Barranquilla, 55,000; Medellin, 53,000; Cartagena, 25,000; Bucaramanga, 25,000. Caribbean seaports—Cartagena (declined), Sabanilla (port of Barranquilla); Pacific, Buena Ventura. Races—Spanish-American and Indian. Religion, Roman Catholic. Foreign trade (1911)—imports, $18,108,863; exports, $22,375,900.

The Belgium Congo.—A Belgium colony in Africa, administered by a Governor General. Area, 939,292 square miles; population, estimated, 8,000,000, between 6° north and 14° south latitude and 12° and 32° east longitude. Boma, 50 miles up the Congo, is the capital. The colony is divided into 22 districts for administrative purposes.

The river basin is the second largest in the world, and most of it is included in the Congo state. The state is chiefly a high, flat table-land, bordered on the west by mountains, through which the river has cut its way for 270 miles, dropping to the coastal plain 1,800 feet in that distance. There is navigation up the lower Congo for 90 miles from its mouth; Matadi is the head of navigation for ocean steamers. The rapids through the mountains are circumvented by a railroad to Stanley Pool, above which about 8,000 miles of navigation are spread along the various branches of the upper Congo system. The climate is torrid, and, excepting at some places, unhealthful for the white races; but

the heat is tempered by the elevation of the plateau, and as the whites have learned the conditions of health, the mortality among them has been reduced more than one-half. Great tropical forests are found only in the east and northeast, the most of the state being rolling grass-lands, interspersed with areas of timber. The government has a large number of stations, and many posts are maintained by missionary and trading societies. A profusion of tropical plants and animals provides abundant food for the natives. The chief commercial products as yet are rubber, ivory and palm oil, but some cotton, coffee and tobacco plantations are beginning to flourish. The wealth in rubber is enormous. It is a misdemeanor to kill the rubber plant, and millions of them are being set out in plantations. European cattle, introduced at 70 stations, are doing well, though they are not succeeding in some districts. Gold, copper, silver and iron are the principal metals, and Katanga, the southeast district, has great mineral wealth. On the upper Congo and its tributaries are 100 small steamers and many tow-boats, which ply to the heads of navigation. Slave-raiding, cannibalism, human sacrifices, etc., are severely punished and suppressed wherever the government has brought the country under its influence. Many thousands of the younger natives are being taught trades, and all manual and considerable skilled labor is performed by natives under white supervision. Foreign trade (1911)—imports, $9,942,960; exports, $10,804,295, three-fourths rubber.

Corea.—Practically a Japanese colony in Asia. Area, 84,400 square miles; population (1912), 13,832,376; government, imperial, strongly under Japanese influence. Between 34° and 44° north latitude and 125° and 131° east longitude. Capital, Seoul; population, 193,640. A very mountainous peninsula, about 600 miles long and 135 miles wide at its broadest part. It has a few excellent harbors and a good climate. Most of the

people are farmers, and agriculture thrives best in the southern half of the peninsula, rice and beans being the chief crops. The industry is greatly hampered by lack of room, as the valleys are narrow. Many mountain-sides are terraced and cultivated. Gold and coal has been found in many places, and a number of foreign companies, especially Americans, are beginning to work concessions. Railway lines are gradually being built. See Panama Canal Globe. Ponies, wheelbarrows, and sedan-chairs are used for most of the freightage and passenger traffic. The important ports, Fusan, Chemulpo, Mokpo and Wunsan, are open to foreign traders. Besides Coreans, 242,000 Japanese, 16,000 Chinese, and a few hundred Americans and Europeans live in the country. Religions—Buddhism, Confucianism, 58,800 Roman Catholics and 28,000 Protestants. Trade (1912)—imports, $27,405,500; exports, $12,301,825.

Costa Rica.—A Central American republic. Area, 18,400 square miles; population in (1911) 388,266. Between 8° and 12° north latitude and 81° and 86° west longitude. Two parallel mountain ranges cross Costa Rica, with the depression of Cartago between them. Several active volcanoes are in the northern range, and among them Turrialba and Irazu are over 11,000 feet in height. The southern chain also has lofty mountains. A third of the population live on the Pacific or dry side of the mountains, many having relations with the coffee plantations that supply Costa Rica with more than half of her exports. Coffee is the largest crop, and is noted for its excellence. It constitutes 46% of the republic's exports. Cattle are herded on the uplands, but the home supply of beef is not equal to the demand. San José, the capital, on the table-land, in the heart of the coffee district, has 24,963 inhabitants, and is connected by rail with Puerto Limon, the Atlantic port. There are about 400 miles of railroad lines in the country. Punta Arenas is the Pacific port.

Races, Spanish-American and Indian. Religion, Roman Catholic. The imports are hardware and manufactures, more than half coming from the United States. Foreign trade (1911)—imports, $8,967,561; exports, $9,020,150.

Cuba.—Area, 40,000 square miles; population (1910), 2,220,278. Between 19° and 23° north latitude and 74° and 85° west longitude. Havana is the capital; population, 297,000. Other large ports, Cienfuegos, 30,000; Santiago, 45,478; Matanzas, 45,282. Cuba is the largest island of the West Indies and the largest fertile island of America. It embraces nearly half the land surface of the West Indies. Its deeply indented coasts provide many excellent harbors, which is one of its great commercial advantages. In the west are the low mountains, Sierra de los Organos, on whose southern slopes (Vuelta Abajo) the most highly prized tobacco of Cuba is raised. In the east are higher mountains, where agriculture is much diversified, but this region yields less for export than other parts of the island. Between the eastern and western mountains are the rich central plains that produce the great sugar crop of Cuba and give pasturage to large numbers of cattle. The climate is tropical, tempered by the northeast trade winds so that the white race can live in any part of the island. The cities in which sanitary regulations are now enforced have become healthful. Sugar from sugar-cane and tobacco are the two great crops. About two-thirds of the tobacco crop is exported. Cocoanuts and bananas are exported from the eastern part of the island. In the last decade the banana trade has declined because of the larger returns of the land planted to cane. The eastern mountains yield prime iron ore and manganese. In 1910 new iron mines were discovered in the vicinity of Mora on the north coast. Short railroads cross the island from north to south, and the line from Havana to Santiago was completed in 1903. Wagon roads are still very poor.

Steamers in the coastal trade make the circuit of the island. About two-thirds of the people are Spanish-Americans, 142,000 foreign whites, 234,000 negroes, 271,000 mixed blood, and 14,000 Chinese. Religion, chiefly Roman Catholic. Havana is the great tobacco and Matanzas the sugar port, the United States having the greater part of the trade. Foreign trade mainly with the United States. In 1910 this country took 86 per cent. of the Cuban exports and supplied 50 per cent. of the imports. (1911) —imports, $113,055,774; exports, $125,943,652.

Canada, Dominion of.—A British colony, with the executive government vested in the British sovereign, and legislative functions in a parliament, of which the House of Commons is elected by popular vote. Area, 3,745,574 square miles; population, (1911), 7,205,364. Capital, Ottawa; population, 86,340; Montreal, 466,197; Toronto, 376,240; Quebec, 78,067; Hamilton, 81,879; Halifax, 46,081. It extends from 42° north latitude to the Arctic Ocean, above 77° north latitude, and from 52° to 141° west longitude. It includes nine provinces, British Columbia, Manitoba, Nova Scotia, Ontario, Quebec, New Brunswick, Prince Edward Island, Saskatchewan, and Alberta (the last two organized in 1905), and the Northwest Territories and Yukon. The boundaries of the eastern provinces were changed in 1912 as shown on the Panama Canal Flat-Globe. The area of both Manitoba and Quebec provinces was considerably increased by extension of territory to the north. It has the ocean on three sides, and the Great Lakes on the south. The Atlantic ports are nearer to European markets than are those of the United States. Canada is a broad, low plain, excepting in British Columbia, which is the mountain region. The southern part of the eastern plain, once heavily forested, has been largely cleared for farms. The south central plain, extending in to Athabasca from the southern border, is a comparatively level prairie with deep rich soil, one

of the finest farm and grazing regions in the world. This region is attracting large immigration. About 70 per cent. of the population are farmers, with wheat, oats, barley and maize as the great grain crops. Fruit raising is important in Ontario and Nova Scotia. Wide areas of forest in northern Quebec and Ontario and in British Columbia yield great wealth in lumber, and the manufacture of wood pulp for paper making is very large. The mountain plateau is the source of most of the metals, though iron is mined on the east coast. Canada is usually the fourth or fifth country in the annual world-product of gold, is one of the two largest producers of nickel, and mines much coal. The fisheries employ 80,000 persons. The annual value of this trade exceeds $34,500,000. The vast regions north of the forests are not likely to be of great value unless mineral wealth is discovered. The St. Lawrence and Great Lakes afford large facilities for transportation. Railroads are well developed in the southeast, and the Canadian Pacific Railroad is the only transcontinental line in America owned by one company. Another transcontinental line (The Grand Trunk Pacific Railroad) from Quebec through Winnipeg to Prince Rupert is in construction. The mileage constructed by June, 1911, was 25,406 miles. Races —British-American, French and Indian. Religions, Protestant and Roman Catholic. Foreign trade (1911)—imports, $559,320,544; exports, $315,317,250.

Denmark.—A limited monarchy. Area, 15,289 square miles; population, (1911) 2,757,000. Between 54° and 58° north latitude and 8° and 13° east longitude. Capital, Copenhagen; population, 462,000. Other large cities—Aarhuus, 62,000; Odense, 42,000. Copenhagen is one of the free ports of Europe, all goods admitted to the free port being exempt from customs duties. Thus they may be reshipped to foreign ports without examination but if sent into Denmark outside of the free port, they must pay

tariff charges. The kingdom is entirely lowland, and the west coast is protected from the sea by dikes at many points. The Baltic islands, excepting Bornholm, are flat and fertile, but large areas of moor and sand are met in Jutland. The climate is oceanic, mild for the latitude, but great storms sometimes lash the coasts. The very prosperous Danes have agriculture and cattle breeding as their chief resources. Two-thirds of the land is fertile, the pastures are large and rich, and stock farming is the special sphere of the Danish farmer. The export of butter and eggs is enormous. The kingdom is poor in minerals and entirely wanting in metals. As fourth-fifths of the inhabitants are agriculturists, manufacturing has only a minor role, and industrial establishments are mainly supported by the farming and sea-faring interests. Beet sugar is refined, flour mills are numerous, factories make sail-cloth, leather, and prepare tobacco and the brewing and distilling interests are large. Copenhagen and Odense, where manufacturing is mainly confined, produce also machinery, porcelain and cloth. On the whole, Denmark supplies its own wants but poorly, and most manufactures are imported. The rail and wagon roads are adequate and excellent. Race, Danish. Religion, chiefly Lutheran. Trade (1911)—imports, $192,525,000; exports, $172,585,000.

Dutch East Indies.—Colonial possessions of the Netherlands. Area, 584,000 square miles; population (1911), 39,079,000. Between 5° north latitude and 11° south latitude and 95° and 131° east longitude. Batavia is the capital; population, 138,000. Other largest towns in Java—Surabaja, 150,000; Surakarta, 118,000. This group of islands comprises Java, Madura, Sumatra, most of Borneo, Banka, Billiton, Celebes, Rian, Lingga, the Molucca Archipelago, and the small Sunda Islands. Java is the most important, and produces large quantities of sugar, tea, indigo, cinchona bark, and tobacco. Sumatra is where a

tobacco prized for cigar wrappers is grown. The Dutch are very skillful in their colonial policy, which is based upon the maxim, "The Dutch colonies for the Dutch." The Dutch protect the natives from arbitrary oppression and spoliation, and have made the East Indies an inexhaustible source of wealth for the mother country. The climate is tropical, but all the islands are mountainous, and cool retreats are accessible. Java (population, 30,098,000) is the most densely peopled land near the equator. Next to Cuba, it is the largest producer of cane-sugar. Java coffee is sent to all parts of the world. The island is the largest producer of quinine, and the tea plantations yield important returns. Sumatra's products are like those of Java, but it grows a far larger amount of tobacco. A large part of the spices, tortoise-shell and pearl-shell in the world's trade comes from the other Dutch islands. Batavia, in Java, is the commercial center of the colony. Four-fifths of all products are sent to Rotterdam and Amsterdam, where they are greatly enhanced in value by manufacture and preparation for market. Dutch merchants sell these products in many lands, and send to the East Indies great quantities of cottons and other manufactures; so that the Dutch East Indies are the best customers of the Netherlands, excepting Europe. Race, Malayan stock. Trade (1910)—imports, $144,664,500; exports, $188,575,000.

Ecuador.—A South American republic. Area, 116,000 square miles; population, 1,500,000, (1910 estimate). Between 2° north latitude and 5° south latitude and 74° and 81° west longitude. Capital, Quito; population, 50,000. Other cities, Guayaquil, 51,000; Cuenca, 30,000; Riobamba, 18,000. Ecuador, so called because it lies under the equator, illustrates the influence of altitudes on climate and production. On the narrow Pacific coast plain there are tropical forests, high grasses, rubber, cacao and many other products of the hot lands. The people live in thin-

walled houses. Only 70 miles to the east is the high plateau of Ecuador, between the Cordilleran ranges, where the population is housed in stone and adobe dwellings amid fields of wheat, barley, potatoes and alfalfa. Further east the land slopes to another forested tropical plain. The lowland east of the excellent port of Guayaquil and the plain of the Rio Guayas are a continuous garden, rich in tropical vegetation. Here sugar-cane is cultivated, but above all cacao, which is the principal wealth of the country, and Ecuador is the largest source of supply. Cacao is over three-fourths of the total exports. They need wheat on the coast, but the wheat-fields of the high plateau have been inaccessible because only mule paths connected the high with the low-lying regions. The railroad from Guayaquil has been pushed to the plateau of Quito. The eastern lowlands have rubber and gold still almost inaccessible. The coast Indians produce the famous Panama hats from the fine straw of the toquilla, called Panama simply because they are forwarded to market through that port. There are few other manufactures except the products of a small number of woolen and cotton mills, saw mills, chocolate works, and soap factories, chiefly at Guayaquil, which has the best harbor on the west coast of South America, and handles nearly all the foreign trade. The imports are mainly manufactures and foodstuffs. Races, Spanish American and Indian. Religion, chiefly Roman Catholic. Foreign trade (1910) — imports, $8,024,105; exports, $13,666,371.

Egypt.—A tributary state of Turkey, with a Khedive as sovereign, but in its financial and economic administration under the control of Great Britain. Between 22° and 32° north latitude and 24° and 38° east longitude. Area, 383,000 square miles, including the deserts. The area of the cultivated and densely populated land is only 10,000 square miles, a narrow strip along the banks of the Nile about the size of our state of New Hampshire.

Population, including the Sudan, 13,687,000. Capital, Cairo, population, 654,000; Alexandria, the chief port, 332,000; Port Said, 49,000 Egypt is a rocky and barren upland, with no marked protuberances of the surface except the mountains between the Nile and the Red Sea. It is a continuation of the Sahara. The broad channel of the mighty Nile traverses this desert, and where it overflows its banks or is carried by irrigation to the land, it covers the desert with luxuriant subtropical flora. It is thus the life of E ypt. The greater part of its waters comes through the Blue Nile from Abyssinia, and the fertilizing silt is also chiefly derived from the eastern tributaries bringing rock waste from the Abyssinian highlands. Much water has gone to waste because at flood time the Nile brings a larger supply than can be utilized, while at low Nile there is not sufficient water for the crops. This difficulty has been removed by the great dam built at Assuan, which impounds the surplus waters at flood, forming a great lake which at low Nile is run through the sluices and carried into the irrigation ditches, so that today Egypt is raising two to three crops from the same land each year where formerly only one crop was possible. About 6,000,000 acres are under crop. Besides supplying food for its millions of inhabitants, Egypt is sending to American and European factories almost all the cotton it raises, a fiber of peculiar excellence. Wheat, maize and onions are also large export crops. The live-stock industry is subordinate, though many dromedaries, cattle, goats and poultry are raised. There is little mining, though gold is now being taken from the mountains east of the Nile. Petroleum has also been discovered along the Red Sea coast. The Suez Canal made Egypt the connecting link between Europe and eastern Asia, and stimulated its trade. Races—38,200 Greeks, 24,500 Italians, 19,600 British, 14,200 French, and a few Austrians and Germans. Religions—

chiefly Mohammedan, 10,366,000 Christians, 881,000 Jews. For foreign trade (1912 excluding specie)—imports, $129,538,795; exports, $172,861,605.

France.—A republic. Area, 207,127 square miles; population (1911), 39,601,000. Between 42° and 51° north latitude and 8° east and 4° west longitude. Paris is the capital; population, 2,888,000. Other largest cities Marseilles, 550,000; Lyons, 523,000; Bordeaux, 261,000; Lille, 217,000; Toulouse, 149,000; Havre, 136,000. With the sea on three sides (Atlantic coasts, 962 miles, Mediterranean, 300 miles), the republic is very favorably situated for sea traffic with the Western world and the Orient. The greater part of France is lowland or occupied by mountains of only moderate height. The eastern half, on the whole, is mountainous; the western half is level, a great continuous plain stretching from the north through the whole west of France. The soil is nearly everywhere fertile. France has over 150 rivers navigable for large or small craft, the most important being the Seine, Loire (navigation somewhat difficult), the Charente, the lower Gironde, the Adour, the Rhône (of little value for navigation), the Meuse, the Somme and the Moselle. Many excellent and convenient canals connect all the principal rivers. France has the most delightful climate in Europe, giving agriculture a fortunate combination of central and south European conditions of farming. More than half the surface is under cultivation, and nearly half the people live on farms, most of them so small that France has many farm holdings as there are in the United States. There are few good harbors, most of them being river ports or artificial harbors, like Cherbourg. The sea trade is carried on chiefly through Marseilles, Havre, Bordeaux, and Dunkirk. France is, next to Russia, the largest wheat-growing country of Europe, oats being the second most important cereal.

The sugar beet and tobacco are great industrial crops. Wine is the national beverage, and France is the greatest wine-growing country of the world. All domestic animals are raised scientifically, and dairy products have high reputation. The fisheries are very important, and sardine canning is one of the large industries. France has much coal, but not enough coal and iron to supply the home demand. Manufacturing is very highly developed. Over 1,000,000 persons are employed in making textiles; French silks, cottons and woolens are unsurpassed. Many classes of French goods, including porcelains, glassware and metal products, are distinguished for good taste, elegance and finish, while other nations surpass France in the cheap commodities. The Paris district is particularly noted for the production of *articles de luxe*. Race, French and 1,051,907 foreigners, including over 12,000 Americans. Religion, Roman Catholic, about 600,000 Protestants and 50,000 Jews. Foreign trade (1912)—imports, $1,590,170,000; exports, $1,327,270,000.

French Indo-China.—French colonial possession in south Asia. Area, 243,240 square miles; population, (1911), 16,990,000. Between 23° and 9° north latitude and 102° and 110° east longitude. These dependencies include Cochin-China, Cambodia, Annam, Laos and Tonkin. Cochin-China is the oldest and, commercially, the most important, consisting chiefly of the rich alluvial lands of the Mekong delta, covered with rice-fields. The far interior of Tonkin and Annam is mountainous, but Cochin-China and Cambodia are almost entirely low alluvial lands while the low delta lands of Tonkin extends far inland, and the coastal belt in Annam is adapted for rice culture. Five-sixths of all the cultivated land is under rice, which is the great export crop. Tobacco is raised in Annam and Cambodia, tea in the mountainous parts of Annam and Tonkin, and there is a small cotton

industry in Tonkin. Communications on the great streams are not of the best because they are interrupted by rapids. The Mekong affords good facilities for navigation to Sambor, in northern Cambodia Tonkin has large coal measures, but only 300,000 tons are mined annually. Rice exports exceed 500,000 tons a year, France taking most of the crop. The chief towns are Hanoi (capital), 150,000; Hué, 50,000; Pnom-Penh, 50,000; and Saigon, 32,000. Races—Annamese, Chinese, Laos and Malayan. Roman Catholic missions claimed 420,000 native converts. Foreign trade (1910)—imports, $49,671,000; exports, $58,109,000.

Germany.—A limited monarchy. Area, 210,273 square miles; population (1910), 64,926,000; capital, Berlin; population, 2,071,257; Hamburg (1910), 931,055; Munich, 596,467; Bremen, 247,437; Nuremberg, 333,142; Breslau, 514,765; Cologne, 516,527; Frankford-on-Main, 414,576; Hanover, 302,375; Dresden (1910), 548,300; Leipzig, 589,850; Chemnitz, 287,807. The empire lies between 47°–56° north latitude and 5°–23° east longitude. The northern half is a very low plain, marshy along the Baltic, and rising gently to the highlands of the southern half; back of the highlands are the Alps, on the southern edge of Germany. The Baltic and North Sea coasts are 1,200 miles in length. The harbors are at the mouths of rivers or some distance inland. Hamburg is the third largest port in the world, and handles half of Germany's foreign trade. Bremen, on the Weser, is the second port, and Stettin and Danzig are the chief North Sea ports. The rivers have great importance in transportation; immense sums have been spent on their improvement, and many canals connect them. The Elbe is navigable clear across Germany. The continental climate prevails in the east and the oceanic climate in the west, so that the average temperature of eastern Germany is lower than that of western Germany. About one-fourth of the

country is covered with forests, which are carefully conserved, and a tree must be planted for every one cut down. The growth of manufactures has reduced the agricultural population so that less than half the people are now farmers. Germany has a great variety of agricultural products, but cannot raise sufficient food for her dense population. Nearly half the tilled lands in the northeast and northwest are in rye, Germany being, next to Russia, the largest grower of that crop. The empire leads the world in the production of beet sugar, the sugar beet covering a large area. Wine culture is almost wholly centered along the southwestern rivers, chiefly the Rhine. The warm and fertile Rhine plain between Basel and Bingen is one of the greatest tobacco regions of Europe. Wheat, only half as large a crop as rye, and also barley, are raised chiefly in the southwestern highlands. Oats are a very large crop. Germany raises more potatoes than any other country, chiefly in the sandy northern plain. The hops and beer of Bavaria are famous. The chief dairy industry is in the north, especially in Schleswig-Holstein, where cattle are easily fattened and the grasses conduce to the richest quality of milk. North Germany is also most propitious for horse raising. The goat is the poor man's cow, and many thousands are raised in the southern highlands. Sheep have greatly decreased, and immense quantities of wool are imported for the factories.

Germany is surpassed only by the United States and Great Britain as an industrial nation. Coal and iron are close at hand for German manufacturers. The greatest attention is given to perfecting technical processes. The most important industries are iron and steel, and their manufactures, which are promoted by the great coal-fields of the Ruhr River, Saxony and the Saar. Textiles are the second largest industry, many towns in Rhineland-Westphalia and in the Chemnitz district of Saxony being spinning and weaving centers. The nation's success in many

other fields of manufacturing is very great. Transportation is abundant and comparatively cheap, the splendid development of waterways supplementing the numerous railroads. The imports are enormous quantities of food and raw materials, and the exports are manufactured articles. Race, Germanic and over 500,000 foreigners, chiefly from other European states. Religion —over 37,646,000 Protestants, over 22,094,000 Roman Catholics, 607,000 Israelites. Foreign trade (1912)—imports, $2,530,140,000; exports, $2,185,110,000.

Great Britain and Ireland.—Officially, the United Kingdom. A limited monarchy. Area, 120,979 square miles. Between 49°-60° north latitude and 11° west-2° east longitude. Population (1911), 45,365,000. Capital, London; population (1912, Greater London), 7,252,000. Other cities, Glasgow, 84,000; Liverpool, 746,000; Manchester, 714,000; Birmingham, 525,000; Leeds, 445,568; Sheffield, 454,653; Dublin, 415,866; Belfast, 385,492; Bristol, 357,059; Edinburgh, 320,315. Great Britain consists of England, Scotland and Wales.

An extensive, undulating and fertile plain covers the south and east of Great Britain. Mountains rise in the north and west, covering two-fifths of the total surface. The mountains of north Scotland are mostly destitute of cultivation. Most of Ireland is an undulating interior plain, with mountain ranges near the sea surrounding it. Most of the plain is very fertile, but one-seventh of Ireland is covered by bog and moor. England has fifty rivers navigable by large or small vessels, chief of which is the Thames, commercially the most important river in the world, although only 220 miles long. Scottish rivers are of little commercial importance, but Ireland has many navigable streams, among which the Shannon is navigable for almost its entire length. In England there are over 2,500 miles of canals, and a great ship canal connects Manchester with the sea. The

climate is oceanic and mild for the high northern latitude. The abundant rainfall is most copious in the west. Severe storms in autumn and winter sometimes do great damage on the coasts.

Agriculture is not so important as manufacturing. Only 18 per cent. of the land is plowed. Cereals in wide areas find the climate too cold or too humid, but conditions are extremely favorable for natural meadows, and nearly half the farming lands are in pastures or hay. No other nation has finer breeds of cattle, horses and sheep. Still the country needs to import enormous quantities of dairy products, and the imports of wheat and flour have increased 70 per cent. in a century. Maize does not ripen, and oats is the most important cereal crop. The fisheries employ 107,000 men and yield $50,000,000 worth of fish every year.

The mineral riches are very great, far exceeding in value the agricultural products. The coal-fields, with about 4,000 mines, are among Great Britain's most valuable possessions. The most important metal is iron, the mines being situated near or among the coal-fields. The nation, next to the United States, is the largest producer of iron and steel. More salt is mined than in any other country, and the tin mines produce annually about 15,000 tons of ore.

The textile industries are first in the list of manufactures, the greatest centers of the cotton industry being around Manchester, Derby, Nottingham, Glasgow, Paisley and Belfast. About 600,000,000 pounds of wool are absorbed annually by the woolen industries. Linen manufacture is very ancient in Ireland, and is one of its leading industries. The silk industry does not meet French competition nor supply the home demand The metal industries form the second great department of manufactures. Besides steel rails, armor plates and steel for bridges, railroads, ships, etc., machinery is made in over 2,000 machine shops, producing

wares of every kind that are marketed all over the world. Earthenware and glass, chemicals, leather, and, in fact, all branches of manufacturing are of the highest development.

Great Britain is the leading commercial nation, as its trade is world-wide in the fullest sense. The railroads are solidly constructed, usually with double tracks, and the speed of the trains is the highest in Europe. The country's activities are wonderfully stimulated by enormous capital, which works not only at home but also all over the world. About half of the exterior investments are in the British colonies, and the other half in foreign lands, bringing home annual dividends of about over $400,000,000.

Races—English, Scotch, Welsh, Irish and 266,000 foreigners. Religions—Established Church, about 19,000,000; Scottish Church, about 1,500,000; Protestant Dissenters, 6,000,000; Roman Catholics, 5,500,000; Israelites, 50,000. Foreign trade (1912)—imports $3,724,482,570; exports, $2,996,359,535.

Greece.—A limited monarchy. Area, 25,224 square miles. Population, (1907), 2,631,000. Between 35°-40° north latitude and 20°-26° east longitude. Capital, Athens; population, 167,000. Other towns, Piræus (port of Athens), 71,000; Patras, 37,958; Trikala, 21,149; Corfu, 27,000. The kingdom includes many islands of the Ægean and Ionian seas. Greece has two main divisions, northern Greece and the Morea, connected only by the narrow isthmus of Corinth. Both parts are covered by mountains and hills, the only considerable plain being that of Thessaly, in the north. The mountains are mostly barren and arid, but the islands, though mountainous, are tolerably fertile. The rivers are merely coast streams, and Greece is not richly supplied with water. The irregularity of the coast line, affording many good harbors, is of much importance. The coasts and islands have a mild climate, but the isolated mountain gorges

and valleys suffer from extremes of heat and cold. Only 19 per cent. of the area is cultivated, and agriculture is backward and does not produce sufficient cereals for home consumption. The best farming region is the highly fertile plain of Thessaly, from which considerable wheat is derived. Barley, maize and rice are also important crops. The conditions are favorable for tobacco culture, and a large part of the so-called Egyptian cigarettes is made from the tobacco of Greece. Stock raising is insignificant, sheep and goats take the place of cows, and much cheese is made from sheep's milk. Lead, zinc and manganese are mined. The household industries are most important, but cotton and woolen cloths are produced in a number of towns. Zante and some other regions produce the famous Zante currant, which is the chief export. Communications are poor and insufficient. 830 miles of railways are operated. Races—the Greeks are descended from the ancient Greeks, with Illyrian and other admixtures; Albanians, Wallachians, Armenians, Turks, etc. Religion—Greek Orthodox, 2,000,000 other Christians, 6,000 Israelites, 24,000 Mohammedans. Trade (1911)—imports, $34,697,485; exports, $28,180,530.

Greenland.—The largest island of the world. Area, about 515,000 square miles, or one-sixth as large as the United States; area of coast-lands not covered by glaciers, about 35,000 square miles. Between 60°-83° 40′ north latitude and 20°-75° west longitude. The inhabited parts of the west and east coast are occupied by Denmark as far as 74° north latitude on the west and 67° north latitude on the east coast. Principal town Godthaab. Population, 13,000 (Eskimos and a few Danes) on the Danish west coast, about 500 on the Danish east coast; about 500 (Arctic highlanders) in northwest Greenland between Cape York and Etah. The interior is covered by an ice-cap thousands of feet in thickness, the coasts are mountainous, with

deep fiords, and many glaciers move down them from the inland ice. The ends of the glaciers at the sea edge break off as icebergs, and many float southward to the tracks of trans-Atlantic steamers. The coastal vegetation is scanty, chiefly mosses and lichens, with here and there patches of grass. The few stunted trees in south Greenland rarely grow higher than a man's head. The chief animals are the musk-ox, reindeer, Arctic fox, polar bear, and the coast waters are frequented by seals, walruses, fish, some whales, and countless numbers of eider ducks and other birds. The natives struggle hard to gain a livelihood. Seal blubber is transformed into grain oil, and seal, polar bear and white fox skins, eider down and a little whalebone are collected. Coal is found, but the only mineral of importance yet worked is cryolite, the mines at Ivigtut being the only known deposits of commercial importance. This mineral is mined by Americans under contract with the Danish government. Danish trading stations supply the Eskimos with commodities in exchange for the collection of skins, etc., which they make. In 1911 imports from Denmark, $1,643,550; exports to Denmark, $733,300. Trade in Greenland is a state monopoly.

Guatemala.—A republic of Central America. Area, 46,774 square miles; population estimated in 1910, 1,992,000. Between 13°-18° north latitude and 89°-93° west longitude. Capital, Guatemala; population, 100,000. Guatemala has larger business relations with the rest of the world than any other Central American republic. Most of it is an elevated plateau, with a broad frontage on the Pacific and a very short Atlantic coast line. Maize and black beans, the chief food staples in Central America, are grown everywhere, and coffee, the great export crop, thrives from the Pacific to the center of the republic. Much sugar made from the sugar-cane is consumed at home, but little is exported. Cotton-fields and sheep pastures on the higher land supply fiber

for spinners and weavers, and cattle scattered over the plateaus yield hides for export. Most of the commodities required by the people, except textiles and flour, are the products of home industry. A railroad from the Atlantic ascends the valley of the Motagua River to the city of Guatemala, which is also connected by rail with the Pacific port of San José. Livingston and Puerto Barrios, the Atlantic ports, ship much coffee. Races, Spanish-American and Indian. Religion, Roman Catholic. Trade (1911)—imports, $6,514,421; exports, $10,981,724.

Guiana, British.—A British colony in South America. Area, 109,000 square miles; population (1911), 305,000. Between 1°-8° north latitude and 57°-62° west longitude. Capital, Georgetown; population, 53,176. The low coastal plain, hot and fertile, is covered with plantations, cultivation being confined chiefly to this narrow zone, where most of the population lives. These lowlands were diked and are extensive enough to form an important factor in the rice production of the world. Further inland the country becomes hilly and mountainous, with wide forest areas and considerable gold. The short Demerara railroad was the first to be built in South America. It was constructed to meet the needs of the sugar industry, which, with its by-products, rum and molasses, was long the great industry of the three Guianas. Cheap sugar at last seriously injured the industry, and the plantations also suffered from encroachments of the sea. Many planters abandoned sugar for tobacco and rice. The rice plantations now cover 38,000 acres. Gold, rubber, sugar and rice are sent to Great Britain and the United States, the imports consisting of foodstuffs and general manufactures. Races—6 per cent. whites, 40 per cent. East Indian coolies, 41 per cent. negroes, Chinese, mixed breeds and Indians. Foreign trade (1911-12)—imports, $8,932,870; exports, $10-864,000.

Guiana, Dutch.—A colony of the Netherlands in South America, east of British Guiana. Area, 50,000 square miles; population (1911), 86,233. Capital, Paramaribo; population, 33,000. The physical features are like those of British Guiana (which see). In both Dutch and French Guiana sugar cultivation is considerably smaller than in British Guiana, and primitive methods are employed for making sugar. Considerable cacao is produced. The commercial center is Paramaribo, and nearly the entire trade is with the Netherlands. The gold exports are over $500,000 a year. Races, chiefly Dutch, also negroes and Indians. Foreign trade (1910)—imports, $3,093,600; exports, $4,500,000.

Guiana, French.—A penal colony of France, east of Dutch Guiana, in South America. Area, 31,000 square miles; population, (1911), 49,000. Capital, Cayenne; population, 10,600. A few thousand French convicts most of them free, live in the colony. It differs from British and Dutch Guiana, as its 200 miles of coast lands are comparatively high, and its islands supply phosphates for export. It is little developed, and has comparatively few plantations. Cacao grows wild, and its cultivation was long important, but has declined because the people are neglecting agriculture for gold mining, which, with sugar and coffee, is its chief interest. Races—French, Indian and negro. The trade is chiefly with France. Foreign trade (1910)—imports, $2,442,205; exports, $2,313,435.

Haiti.—A French colony (1697-1801). A negro republic on the island of Haiti, West Indies. Area, 10,204 square miles; population (1910), 2,029,000. Between 18°-20° north latitude and 71°-75° west longitude. Capital, Port au Prince, population, 61,000; Cape Haitien, 29,000; Aux Cayes, 25,000. Very mountainous; interior communications so poor that the people usually prefer to take the sea route to other parts of the coasts. Climate,

tropical, tempered by the northeast trade winds. Coffee is the chief product and export, and is superior in quality, though little attention is paid to its cultivation. Logwood and cacao are other important exports. The coarse cotton textiles, breadstuffs and kerosene, which form most of the imports, are largely supplied by the United States. Race, French-speaking negroes. Religion, Roman Catholic. Foreign trade (1910)—imports, $7,681,746; exports, $15,475,331.

Guam.—A Pacific colony of the United States. The largest, most populous and most southern of the Marianne Islands, a group lying along 145° east longitude, between 13°-20° north latitude. Area, 207 square miles. The highest land is only 1,274 feet above the sea. A mountain chain extends near the southeastern and southern coasts, the rest of the island being mainly a plateau heavily forested with cocoanut groves, maize, taro and garden truck planted in narrow strips along the sea. The interior of the island has not been cultivated, but almost the entire southern half is well adapted for cattle ranches, and the northern half for coffee, cacao and cocoanuts. The climate is healthful, and on the whole pleasant, the heat being tempered by sea breezes. Rainfall is heavy between June and December, and the island is occasionally visited by severe typhoons. The inhabitants are the native Chamorros (devout Catholics), some immigrants from other islands and the American contingent. The population was 12,517 according to the census of 1910, of whom three-fifths live in the town of Agaña. Other towns in order of size and importance are Sume, Agat, Merizo, Inarajam, Umatac, Piti and Sinajaña, ranging in population from 650 to 150. By far the most valuable crop is the cocoanut (copra), followed by sugar, coffee and cacao. The commerce is very small, but the development of copra-drying promises to be a source of prosperity.

Hawaii.—Or the Hawaiian Islands. Annexed to the United States in 1898, and organized as a Territory in 1900. Include eleven islands, eight of which are inhabited. In the Pacific (Polynesia), between 18°-23° north latitude and 154°-161° west longitude. Area, 6,449 square miles; population, 191,909. Capital, Honolulu; population, 39,306. The islands are separated from one another by ocean channels varying in width from 6 to 61 miles. In order of size, the inhabited islands are: Hawaii, 2,000,000 acres; Maui, 400,000; Oahu (seat of government), 360,000; Kauai, 350,000; Molokai (partly leper settlement), 200,000; Lanai, 100,000; Niihau, 70,000; Kahulawe, 30,000. Small as they are, they embrace about as much territory as all the rest of Polynesia. Oahu, the most populous and important commercially, is as large as the Society group. Maui has about the same area as the Marquesas group, and the island of Hawaii, with the remaining islands, is nearly as large as all the other groups of Polynesia.

Hawaii is at the cross-roads of the Pacific, where vessels in the American-Japanese and American-Australian trades put into port. The group is also the starting-point for expeditions to Bering Strait and the South Sea. The geographical position of Hawaii in the central Pacific thus attracts much shipping. The effective area of Honolulu harbor is 131½ acres. Pearl harbor a few miles west of Honolulu is reserved for naval purposes. Its entrance is 4½ miles long, 500 feet wide and 35 feet deep. The group is purely volcanic, rising abruptly from deep water, and containing the loftiest summits of any oceanic islands (Mauna Loa and Mauna Kea, in Hawaii, nearly 14,000 feet). The volcanic forces are extinct in the west, but very active in the east. Below the mountains are fertile plains and valleys. All the soils are derived from basaltic lavas. Sedimentary soils, covering the levels bordering the sea, are very deep and rich.

The dark red soils are immediately above the sedimentary flats and lowlands, and have high fertility. The light red soils on the uplands, near the mountains, are of small depth and less fertile. The climate is about ten degrees cooler than that of any other land in the same latitude. The windward side of the mountains has abundant rain, but there is much less on the leeward side, where most of the plantations are situated. The islands are wholly dependent upon agriculture. Cane-sugar employs most of the capital and labor, furnishes most of the exports, and maintains most of the people. Nearly all the plantations have their own mills and manufacture all the raw sugar produced from their cane. The quantity exported in 1912 was 523,308 tons. The yield of sugar per acre is from 6,000 to over 9,000 pounds. Rice, growing on the lowest flats and close to the sea, has the second place. The rice-growers are almost wholly Chinese. The coffee berry grows wild and is cultivated on the four larger islands. The production now attains 50,000 bags annually. Chinese gardeners supply Honolulu with nearly all its vegetables. Bananas and pineapples are the only fruits figuring in the exports. The pineapple industry is the second in importance. 1,000,000 cans exported in 1912. The forest areas are considerable, but have suffered great reduction. Sufficient cattle are maintained for beef and milk, but the chief supply of butter is by importation. Most of the plantation labor is supplied by Chinese and Japanese. The native Hawaiians incline to work for themselves rather than to take service with employers, and the Portuguese immigrants, energetic and thrifty people, are mostly engaged in horticulture. The American, British and Germans control the planting and commercial interests, which are chiefly in the hands of American settlers and their descendants. About three-fourths of the imports come from the United States. Raw sugar is about nineteen-twentieths

of the exports, and nearly all of it is sent to California refineries. Trade (1912)—exports, $57,759,850; imports, $31,268,800.

Honduras.—A republic of Central America. Area, 46,300 square miles; population (1910), 553,000. Between 13-17° north latitude and 83°-87° west longitude. Capital, Tegucigalpa, in the gold and silver region; population, 35,000. It is second in size of the Central American republics, but though rich in resources, has little commercial development. The population cannot supply sufficient labor for so large an area, transportation facilities are very poor, and fully half of the country is still a virgin waste. The interior plateau maintains many cattle, hides and live animals being important exports. The long Caribbean coast produces many bananas and other fruit for United States consumption, and the Atlantic forests abound with fine tropical timber. Gold and silver are the leading exports, though the mining development is small. The United States supplies a large part of the imports, in which textiles and hardware are prominent. The Atlantic ports, Truxillo, Ceiba and Puerto Cortez, have connections with the United States. The Pacific coast, only forty miles long, has the fine natural harbor of Amapala, from which the metals are shipped. Races, Spanish-American and Indians. Religion, Roman Catholic. Trade (1911)—imports, $3,560,939; exports, $3,024,726.

India.—A part of the British Empire. Area, 1,883,627 square miles; includes Upper and Lower Burma; population, 319,140,569. Between 7°-36° north latitude and 62°-104° east longitude. The capital is Delhi, population, 233,000. Calcutta, population, 1,216,514; Bombay 972,930, Madras, 517,535; Haidcrabad, 499,840; Lucknow, 264,049; Rangoon, 289,432. Executive authority is vested in the Viceroy, appointed by the crown. India has three distinctly defined physical regions: the Himalaya Mountain district, the North Indian Plain, and the Plateau of

the Deccan. The colossal ranges of the Himalayas stretch for 1,500 miles along the north of the country. They divide India from the plateau of central Asia South of the Himalayas is the Great North Indian Plain, well watered and for the most part well cultivated. East of the Indus delta, however, is the Thar Desert, which stretches away almost to the base of the Himalayas. The triangular plateau of the Deccan, from 1,600 to 3,000 feet high, occupies the south of the country. India has great rivers, but the only very important ones for navigation are the smoothly flowing Ganges and the Irawadi, of Burma. The Indus and the streams of the Deccan are too impetuous for convenient navigation.

India has many climates, but all, except regions high among the Himalayas or in favored parts of the Deccan, may be called more or less tropical. Only two seasons are recognized—the dry and the rainy season. The southwest monsoon in summer brings an enormous quantity of water vapor, with which it drenches the Western Ghats, and usually has enough left for the interior highlands; but sometimes this monsoon does not continue long enough to give the Plateau of the Deccan sufficient rain. Then crops fail, and a famine may ensue resulting in the death of many thousands. Many millions of the inhabitants being Brahmanists, they are strict vegetarians, and the mortality in time of famine is increased by the fact that they will not kill their domestic animals for food.

Three-fifths of the people are farmers. They carry on agriculture in a primitive way, and fertilizers are little used, but great irrigation systems have been developed in large districts. Rice, the principal food, can be cultivated only in well-watered regions such as Bengal, the coasts of the Deccan and the valleys. Wheat is sown chiefly in the drier northwest (Punjab), and though it is an uncertain crop, it is often raised in enormous

quantities, much of it being sent to Europe. Next in importance are the fiber crops. India sends a great deal of cotton to China and Japan, in addition to the supply consumed in its manufactures. The fiber is shorter than our staple, and inferior in quality. Jute, cultivated in the damp warm climate of Bengal, holds second rank among the fibers. Opium is a large export, chiefly to China. The teas of India and Ceylon have injured the Chinese tea trade in the British Empire, and are invading many other markets Animal raising is not important; cows give very little milk, but zebus (an Indian variety of cattle) are used for draft purposes The yield of salt is large, and coal mining is constantly increasing. Little else is done to develop India's mineral wealth. India has been famous for centuries for its shawls, textile fabrics, weapons, etc., and in recent years it has developed modern manufactures, such as tanneries, shipyards, iron foundries, etc. Still, the home supply of manufactures is inadequate, and an enormous quantity of them is imported. Religions—207,700,000 Hindus (Brahmanists), 57,300,000 Mohammedans, 9,300,000 nature worshipers, 8,500,000 Buddhists, 2,923,000 Christians, 1,900,000 Sikhs. Foreign trade (fiscal year 1911–1912)—imports, $450,000,000; exports, $719,334,000.

Italy.—A limited monarchy. Area, 110,684 square miles; population (1911), 34,686,583. Between 37° and 47° north latitude and 6° and 19° east longitude. The 1911 census gave the following results: Capital, Rome, population, 538,634; Naples, 723,208; Milan, 599,266; Turin, 427,733; Palermo, 341,456; Genoa, 272,077; Florence, 232,860; Venice, 160,727. The northern part of Italy is continental and the southern part consists of a peninsula and a number of islands, including Sicily, Sardinia and Elba. The continental portion is the great fertile plain of the Po River. Hemmed in between the Alps and the

Apennines, this plain is the scene of Italy's greatest industrial and agricultural activity. The Apennines are the backbone of the peninsula, extending down its center. Most of the peninsula is well watered, but it has almost no large rivers. Agriculture is in a backward condition, and the peasantry are very poor. The farm lands are usually held in large estates, and leased in parcels to the peasants. This policy is unfavorable for high tillage. Wheat is the chief crop, and much of it is used with Black Sea imports in preparing macaroni, of which Italy makes enormous quantities. The wine crop is next in value to wheat, most of it and the best qualities coming from the south. Olives and olive oil are exported to a certain extent. Italy is the only country of Europe raising large quantities of rice. The production of raw silk is the largest in Europe. Most of the mulberry trees feeding the silkworms are on the Lombardy plain, while raw silk is sent to all the leading nations, silk manufactures being of much smaller importance.

Italy is rich in useful minerals, but very poor in coal, so that a great deal must be imported. The sulphur mines of Sicily supply part of the world's demand. Great quantities of salt are obtained from mines or by evaporating sea-water. Iron ore is obtained chiefly from Elba, but most of it is exported, as there is little development of iron manufactures. The famous marble of Carrara and Massa finds a wide market. Lack of coal is unfavorable for the development of industries, but manufacturing enterprises are slowly growing. Races, Italian and 61,415 foreigners. Religions—62,000 Protestants, 38,000 Israelites, the rest Roman Catholics. Foreign trade (1911 estimated) —imports, $648,112; exports, $418,623.

Jamaica.—The largest colony of Great Britain in the West Indies. Population (1911), 831,383. Between 17° and 19° north latitude and 76° and 79° west longitude. Capital, Kings-

ton; population, 50,000. A mountain range forms the axis of the island, extending through it from east to west, the highest peak rising to 7,400 feet. Climate, tropical, with cooler temperature in the highlands. All tropical productions are grown to perfection. The sugar plantations were once famous, but many planters have abandoned the industry, owing to low sugar prices; and fruits, chiefly bananas and oranges, now form nearly half the exports. Coffee, rum, sugar, pimento and Jamaica ginger are also important exports. The highways are fairly good, and three railroads serve the eastern half of the island, but Jamaica is still far behind Cuba and Porto Rico in economic development. Races—negro, mixed breeds, white—only 2.5 per cent. of the whole—and East Indians about the same proportion. Foreign trade (1911)—imports, $14,327,765; exports, $14,740,335.

Japan.—A limited monarchy. Area, 160,969 square miles; population (1912), 52,200,679 (with Formosa). Between 22°–51° north latitude and 120°–155° east longitude. Capital, Tokio, population, 2,200,000; Osaka, 1,230,000; Kioto, 450,000; Nagoya, 400,000; Kobe, 378,000; Yokohama, 399,000; Hiroshima, 150,000; Nagasaki, 180,000. Like Great Britain, Japan is an island kingdom. Important international events of recent years have placed Japan in the first rank among nations—in the peace settlement between Japan and Russia (1905) of the contentions that caused Japan to make war on Russia, Japan was by treaty ceded the half of Sakhalin Island from the 50th parallel south. In China her concessions in this settlement were varied and valuable and her prestige in that nation is greatly increased. The empire consists of four large islands and a great number (nearly 4,000) of smaller ones. These islands are mountainous, and a few volcanic summits, such as Fusiyama, reach a height of 12,000 feet or more. Narrow plains

along the coasts and fertile valleys among the mountains are sources of largest wealth. There are no great rivers, but numerous mountain torrents pour down the slopes with short but rapid courses to the sea. An extensive system of canals provides irrigation that supplements the rainfall. The climate is very moist, and is cooler than that of countries of the same latitude in Europe or North Africa. Violent volcanic outbursts sometimes occur, and the country is liable to frequent and disastrous earthquakes. The last very destructive calamity of this nature, the Nayoga-Gifu earthquake of 1891, killed nearly 0,000 people, injured 20,000, and destroyed 130,000 houses.

Agriculture is the principal occupation, and is carried on with painstaking minuteness. Large areas in the mountain regions cannot be tilled, but many mountains are cleared of forest and cultivated to their very tops, and bare rocks are covered with soil brought from a distance. All the lands belong to the state, and are leased to the farmers, who pay a land tax. The chief crop is rice of superior quality. The various cereals and vegetables are grown with success, and cotton is raised in the south. The mulberry thrives, and the largest island produces a great deal of raw silk. The value of this export alone attains $50,000,000 annually. From an export point of view, tea, which is scattered over large areas in the three southern islands, is most important. The United States buys great quantities of Japanese tea. The most important members of the animal kingdom are silkworms, bees and poultry. As the Japanese seldom eat meat, they have no use for cattle except for draft purposes. A small breed of Corean horses is raised. The mineral wealth is being developed. Coal is mined in Yezo and Kiusiu. Japan has the largest copper mines of Asia, copper being the only metal exported. A good deal of antimony is also mined. Iron, steel and their products are large imports.

The empire abounds with the clays that are the basis of its famous earthenware industries.

Modern manufactures have had wonderful development in the past forty years. The Japanese were quick to see the advantages of Western methods, and have applied them with great dexterity. Many of their products, however, are not equal in quality to those they imitate. Their manufactures are in great variety, and not a few of them supply the home need. So many of the people have been diverted from farming to other industries that the cost of living has considerably increased of late years. Among the best industrial products are steamships and steam engines, cotton and silk goods. The people can milk and vegetables, and actually export imitation Swedish matches and Bohemian glass to Europe. The internal trade is facilitated by over 7,000 post-offices, excellent highways, a growing railroad system, and thousands of miles of telegraph line. About 70 per cent. of the foreign trade passes through the port of Yokohama, and Kobe is the second largest port. The economic progress of Japan is indicated by the bank deposits in the whole country, which were in 1893, 37,000,000 yen, while in 1912 they reached 1,868,807,304 yen. Races, Japanese and about 15,000 foreigners. Religions—chiefly Buddhist, 150,000 Christians. Trade, including Formosa—imports, $309,471,289; exports, $263,490,421.

Liberia.—A negro republic in West Africa. Area (estimated), 37,000 square miles; population (estimated), 1,500,000, including 25,000 negroes from the United States, or their descendants. On the Atlantic coast, between 5° and 8° north latitude. Interior boundaries, except between Sierra Leone and Liberia, not exactly defined. Capital, Monrovia; population, 5,000. Settled by emigrants from the United States, the constitution is modeled after that of this country. With a coast

line of 300 miles, Liberia is confined to the basins of the coast streams, none of which is important for navigation. The civilized population lives in towns along the coast and the farming districts near them, or penetrates a short distance up the streams. Behind the mangrove and pandanus swamps near the coast the country rises towards the interior, the successive steps of elevation being marked by rapids in the rivers. Most of the interior is covered with dense forests, among which the native population chiefly lives in a state of barbarism, as few are under government influence or control. Nearly all the colonists live by farming or the collection of palm oil and palm kernels. The chief exports are coffee of excellent quality and palm oil. Monrovia and Great Bassa are the chief ports. Race, negro. Under the law no white man may become a citizen. The official language is English, and most of the civilized negroes are Protestants. Foreign trade (1909)—imports, $1,065,200; exports, $970,500.

Libia.—An Italian colony in Africa since 1911. Area, 350,000 square miles. Population estimated at 1,000,000. Chief towns: Tripoli, population 40,000; Benghazi, 18,000; Ghadames, 8,000. Peopled mostly by Berbers and Arabs. It is divided in the two districts of Libia and Cirenaica, each of which is administered by a governor. The northern section includes fertile valleys which are being developed by the Italians. About 25 miles of railroads had been built by the end of 1912. Products very similar to those of the Sudan. Corn, oil, cattle and dates are the principal articles of export. Foreign trade: Imports, $2,065,000; exports, $2,100,000.

Luxemburg.—A grand duchy of Europe. This state, of triangular shape, occupies the east slope of the Ardennes. Area, 1,008 square miles; population (1910), 259,981. Capital and only important town, Luxemburg; population, about

30,000. Situated in about 50° north latitude and 6° east longitude. Its neutrality is guaranteed by the great powers. The agricultural interests, including wine, mines, quarries and industrial establishments, are important. Its iron and steel industries are important. Nationalities, German and about 4,000 French-speaking persons. As Luxemburg forms part of the German Zollverein, it has no independent trade statistics.

Madagascar.—A colony of France and the fourth largest island in the world. Area, 230,000 square miles; population, including Mayotte and Grand Comorre Islands, 3,078,376. Between 12°–16° south latitude and 43°–51° east longitude. Capital, Tananarivo, population, 55,000. Madagascar is 930 miles long, and its broadest portion, near the center, is 350 miles across. It has a regular form, with few indentations, excepting on the northwest coast, where the best harbors are situated. Since the French occupancy in 1895 the French have carefully explored the island. The elevated interior rises from 3,000 to 5,000 feet above the sea. This is the most healthful region. Around it is a comparatively level country, extending to the sea, much of it heavily wooded, and not far exceeding 600 feet above sea level, very fertile, but not healthful. The leading rivers flow to the west coast, and some of them are navigable by small vessels for 100 miles or so. The capital is in the elevated interior, where live the Hovas, the most advanced and intelligent of the native tribes. The chief port is Tamatave, on the east coast, and Majunga, of less importance, is the leading port on the west coast. The railroad between Tamatave and the capital was completed in 1912. Excellent wagon roads from Tananarivo extend to both the east and the west coasts. Cattle breeding and agriculture are improving under the French régime, and many schools and a number of hospitals have been established. The chief imports are French cotton textiles,

and the exports are rubber, wax, hides, gold and vanilla. Gold and coal mining promise large development. Races—Malagasy tribes, including 850,000 Hovas, and 15,542 Europeans, 1,006 Asiatics and foreign Africans. Religions, chiefly Protestant; about 400,000 Catholics. Foreign trade (1910)—imports, $6,919,000; exports, $9,576,200.

Mexico.—A republic of North America. Area, 767,000 square miles; population (1910), 15,063,000. Between 15°–32° north latitude and 86°–117° west longitude. Capital, the City of Mexico, population, 470,000; Guadalajara, 118,000; Puebla, 101,000; Monterey, 81,000; St. Louis Potosi, 83,000. Mexico is a wide, high table-land between the Gulf of Mexico and the Pacific Ocean, with mountains rising above the plateau on the east and west. There are many volcanic peaks, a few of which are active. The rivers are of little economic importance, the chief streams being the Rio Grande del Norte, forming the northeast boundary, the Tabasco, the Balsas, and the Colorado. There are three climatic zones. On the low and marshy east and west coasts a hot and unhealthful climate prevails, with many earthquakes and hurricanes. These coast lands are called *Tierra calienta.* The *Tierra templada* occupies the middle slopes of the coast mountains, and the lower parts of the plateau in the interior, where the climate is temperate and spring seems to be everlasting. The cold zone, *Tierra fria,* is found on the more elevated table-lands, and the loftier summits are always crowned with snow. The rainy season lasts from May till October.

With great variety of climate, Mexico has many agricultural products, but farming has not reached a high level, though rapid progress is now being made. Dry farming is being developed in the northern states. About one-seventh of the surface has been cleared for tillage. Great landed estates exist which

reproduce many features of the feudal system. The tropical lowlands produce vanilla, coffee, sugar-cane, cotton; and in Yucatan the fiber heniquen, or sisal hemp, which has become the largest agricultural export. Maize and beans are very large crops, and are the staple articles of diet. The favorite national drink, pulque, is prepared from the agave, better known as the maguey plant. Many tropical and other timbers are found in the forests. Most of the agricultural products are consumed at home, and Mexico's tropical fruits, tobacco and coffee have not yet entered largely into the world's trade. Rubber is obtained from the guayule plant found in northern Mexico at elevations of 6,000 to 8,000 feet.

The breeding of domestic animals is growing in importance, and cattle ranches are now numerous in northern Mexico, many of the cattle being sent into the United States. The horses, mules, cattle, sheep and hogs are numbered by millions. But the chief source of wealth is the mineral products.

Mexico is the richest silver-producing country in the world. It is second in copper production and fifth in gold. The total production of gold and silver in the three centuries ending in 1875 was about $3,614,000,000. Iron ore is in inexhaustible supply, and coal is found, but comparatively little is mined. Some zinc is exported to the United States. The precious metals, chiefly silver, form the greater part of the exports. Large wells for petroleum have been sunk near Tampico. The islands off the Campeche coast contain guano deposits.

The Gulf ports, Vera Cruz and Tampico, were very poor, but in recent years have been converted at great expense into safe and commodious harbors. Vera Cruz is the chief port of the country. Progreso is the great heniquen shipping port of Yucatan. The leading Pacific ports are Mazatlan, San Blas, Manzanillo, and Acapulco, but they have little trade. Rail-

roads reach all the most important commercial centers, and connect at Eagle Pass, El Paso and Nogales with the railroad system of the United States. The railroad across the isthmus of Tehuantepec has been rebuilt, the harbors of Coatzacoalcos and Salina Cruz, the ports at the termini of this railroad on the Gulf of Mexico and the Pacific, have been greatly improved, and the Mexicans expect to attract large interocean trade across Mexico at this point. Races—Mexican, Indian, and about 40,000 white foreigners and 3,000 Chinese. Religion, chiefly Roman Catholic. The exports are larger than the imports. Textiles, hardware and machinery are leading imports, half of them coming from the United States and the remainder from Europe. Foreign trade (fiscal year 1911-1912)—imports, $90,965,000; exports, $148,411,000.

Monaco.—A principality within French territory, between Nice and Mentone. Area, 0.58 square mile; population, 19,121. The income of the state is derived chiefly from the tax imposed upon the famous gambling establishment maintained there. Exports of oranges, oils and perfumes. Races, French and Italian. Trade is included in the statistics of France.

Montenegro.—A kingdom of Europe. Area, 3,630 square miles; population, 250,000. Between 41°–44° north latitude and 18°–20° east longitude. Capital, Cetinje, 4,500; Podgoritza, 10,000; Dulcigno, 5,000. It is a mountainous, bare, limestone region, admirably adapted to maintain its independence against the Turks, but it was quite unable to support even its very frugal and warlike population till newly acquired fertile districts bordering on the Adriatic increased the supply of grain, tobacco, vines and southern fruits. The result is that the Montenegrins have been diverted to some extent from cattle raising to agriculture. A small railroad line extends inland from Antivari, scarcely any manufactures, and the small trade

is almost wholly with Austria-Hungary and Great Britain. Nearly everything is imported except food; and animals and their products are the only exports. The seaports are Antivari and Dulcigno. The people are of Servian and to a small extent of Turkish stock. Religions, chiefly Greek Orthodox, with 13,000 Roman Catholics and 13,500 Mohammedans. Foreign trade (1910)—imports, $1,701,385; exports, $500,000.

Morocco.—A French protectorate in northwest Africa. Bounded by the Atlantic and Mediterranean on the west and north, and by Algeria and the Sahara on the east and south. Area, 219,000 square miles; population (estimated), 6,000,000. The three capitals, where the Sultan resides alternately, are: Fez, 100,000; Morocco City, 87,000, and Mequinez. Tangier, on the Strait of Gibraltar, is the principal seaport and the seat of the foreign consuls. Casablanca, Mazagan and Mogador, the Atlantic ports, rank next to Tangier in the value of goods shipped.

Though mountainous in the north and south, Morocco on its central plateaus has rich opportunities for agriculture and stock-raising. Its undeveloped mineral wealth is very great, and in natural resources the state is regarded as richer than any other of the Mediterranean countries of Africa. It is, however, of little commercial importance, for the government is despotic, the taxes are very onerous, life and property are not safeguarded, and the fanatical populace bitterly hate all peoples of non-Mohammedan faith. Under such conditions, extensive commercial development is impossible. By agreement between France and Great Britain and Spain, in 1904, France, with the consent of the Sultan of Morocco, was to be permitted to attempt in that state the same work of development she has achieved in Algeria. If this plan is carried out the development of Morocco will be commensurate with her opportunities. Races

—Berber, Arab, negro, etc. Religion, Mohammedan. The imports are chiefly firearms and ammunition, textiles and hardware, with petroleum from America. Exports, cattle, wool, wax and goat-skins. Foreign trade (1911)—imports, $21,238,-064; exports, $13,639,348.

Netherlands, The.—A limited monarchy of Europe. Area, 12,728 square miles; population (1910), 6,000,000. Between 51° and 54° north latitude and 4° and 8° east longitude. Capital, The Hague, population, 280,000; Amsterdam, 573,983; Rotterdam, 427,000; Utrecht, 120,208; Groningen, 75,341. A flat country with monotonous plains, interrupted only by dunes and a few higher undulations in the east and south. The dunes, stretching along the coast, owe their existence to the winds and seas, which heap the sand into rows of hills. One-fourth of the country lies below sea level, some districts being from 12 to 20 feet below. The whole country would be permanently under water were it not protected from the sea by the dunes and gigantic embankments of earth faced with stone or protected by stakes. These works are called dikes, and they protect the coast from the sea at the points where there are no dunes. The climate is oceanic and moist. The summers are not very warm and the winters are not often very cold. The North Sea washes the whole coast line, which is difficult of access on account of the dunes. The chief rivers are the Rhine, the Meuse, or Maas, and the Scheldt. The river mouths, with their ebb and flow, and a number of bays, chiefly in the Zuider Zee, form the few harbors, of which Rotterdam and Amsterdam command nearly all the sea trade.

The country is a land of canals, all the towns and villages being connected by them. The most important are the North Holland Canal, from Amsterdam to Helder, which, however, is not wide enough for modern large ships to enter; the North

Auckland, 102,676; Dunedin, 64,437; Christchurch, 80,193. The colony consists of three islands—North and South Islands and the small Stewart Island. A few groups of small islands (Chatham, Auckland, and others) are politically united with it. The islands are mountainous, the loftiest peak being Mount Cook, in South Island (12,349 feet). The climate is oceanic, but the loftier mountains are snowclad, affording a rich supply of water to the broad valleys and the plains bordering the sea. The mean temperature of Auckland is 68° Fahr. in January and 50° Fahr. in July. All the climatic conditions make New Zealand a delightful place of residence. The leading branch of farming is cattle and sheep raising, the industry being stimulated by the luxuriant meadows and prairies. This fine natural condition for the animal industry is enlarged by the cultivation of fodder root crops. Sheep (20,200,000 in 1901) are most numerous in the southern part of North and the eastern part of South Islands. Wool to the value of over $15,000,000 was exported in 1901–02. More cattle are raised in North than in South Island. The exports of butter, cheese and meats, sent refrigerated, to Europe are very great. The common farm crops of the temperate zone are constantly developing, and over 8,000,000 acres are under cultivation. The damp, steep western slope has little agriculture, but the warm, dry plains of the east of South Island especially make ideal farming lands. A great amount of wheat, linseed and oats is raised. Phormium, or New Zealand flax, grows wild, and is used for making paper, cordage and some fabrics. Gold is a great resource, and about $250,000,000 of the metal has been exported. Coal and petroleum are also large resources. The harbor of Lyttelton, the port of Christchurch, is the flooded crater of an extinct volcano. Most of the foreign trade is with Great Britain, wool, meats, gold, grain, etc., being exported, while manufactured articles

make up the imports. Races, chiefly British and Maori. Religion, Protestant. Foreign trade (1911)—imports, $97,729,395; exports, $95,142,450.

Nicaragua.—A republic of Central America. Area, 49,200 square miles; population, 600,000. Between 10° and 15° north latitude and 82° and 88° west longitude. Capital, Managua, population 25,000; Leon, 45,000. Nicaragua is the largest state of Central America, with extensive seaboard on both the Pacific Ocean and the Caribbean Sea. As in the other Central American States, the population is largest on the Pacific slope.

The east, covered with tropical forests, is almost wholly unutilized, but a few mining centers have been opened among them. The principal export product, coffee, is chiefly grown in the west around Leon. The banana is planted for export only along the Rama or Bluefields River, which is navigable for 65 miles from the Caribbean. Cattle in the northwest supply many hides for export. Bluefields is the chief Atlantic port, as the larger steamers can no longer enter Greytown Harbor. Corinto (most important for commerce) and San Juan del Sur are the Pacific ports, and a railroad connects Corinto with the large interior towns. Races, Spanish-American and Indian. Religion, chiefly Roman Catholic. Foreign trade (1910)—imports, $2,856,305; exports, $4,545,075.

Norway.—Until 1905 a part of the kingdom of Sweden and Norway, when she seceded from this union and became an independent state in September of that year. Area, 124,454 square miles; population (1912), 2,428,500; capital, Christiania, population, 241,834; Bergen, 76,867; Trondhjem, 45,335. Between 58° and 71° north latitude and 4° and 31° east longitude. Norway is a narrow coast country on the north Atlantic, the entire shore line including fiords and large islands, being about 12,000 miles long. It forms the western half of the largest

peninsula in Europe. The prevailing westerly winds, warmed by their passage over the Atlantic, keep the fifty ports among the fiords open the year round. The same influence makes oats a flourishing crop at 64°, and barley even at 70°. The country is, however, mountainous, and only about 2 per cent. of the land is cultivated, so that the grain and potato crops satisfy only one-half of the domestic consumption. The most important vegetable resource is the forests, which cover one-fourth of the area; t e timber is close grained and tough, and Norway is one of the leading lumber-producing countries, though inferior in this respect to Sweden. Sufficient cattle and sheep are reared to meet the home requirements, but only a small quantity of wool is exported. The most valuable animal product is derived from the sea, the cod and herring fisheries yielding millions of dollars every year, and providing a large part of the food of the inhabitants. About 50,000,000 cod is the annual catch around the Lofoten Islands, and the less valuable herring fishery is pursued all along the coast. Mining is not important, and as coal is wanting and the population is sparse, Norway could scarcely be expected to take a prominent place in manufactures. The wood industries, however, are stimulated by abundant water power; and ship-building, brewing and distilling are important industries. Christiania, Bergen and Trondhjem are the leading ports. Races, Norwegians, Finnish and Lapps. Religion, chiefly Lutheran (the state church), with about 30,000 of other Protestant sects, 2,000 Catholics and 700 Israelites. Foreign trade (1912)—imports, $112,496,776; exports, $72,-209,332.

Orange River Colony.—Formerly the Orange Free State, one of the Boer republics, but attached to the British Empire as a colony at the close of the British-Boer war, now part of the Union of South Africa. Area, 51,120 square miles; popula-

tion (1911), 528,174, of whom 90,000 are whites (80,000 Boers) and the remainder native blacks. Between 27°–31° south latitude and 24°–30° east longitude. It stands on the high plateau of inner South Africa, has a temperate, healthful climate, and is best adapted for stock raising; wheat and other farm crops, however, succeed in the south. Capital, Bloemfontein; population, about 34,000. This town is coming into note as a health resort, and a considerable number of invalids from Europe are living there. The Boers are thinly scattered over the plateau, tending their sheep and cattle. Wool is the chief product, and, with hides and ostrich feathers, forms the bulk of the exports. Some diamonds are mined, but the mineral industries are little developed. Races, Boers, natives of Bantu stock and British. Religion, Protestant. Trade: Imports, $17,730,000; exports, $9,175,000.

Panama.—A republic of North America, formerly a state of Colombia; declared its independence in 1903. It occupies the Isthmus of Panama between Costa Rica and Colombia, with a length of about 480 miles, and varying in width from 37 to 110. Area, 34,120 square miles; population, 419,000. Capital, Panama, population, 30,000; Colon, 5,000. The mountain backbone is boldly defined in the western part, but in the eastern half of the isthmus there is little indication of systematic arrangement in the innumerable hills that cover it. About 150 short rivers flow to the sea from the northern side, and more than twice that number drain the Pacific slope. The largest river, Tuira, is navigable for river schooners as far as Santa Maria del Real. The Bayamo, discharging into the Gulf of Panama, is said to be navigable for small craft 120 miles. Panama has many bays and ports on both oceans, but most of them are in primeval solitude. There is no country behind them which offers an easy field for development. Thick forest

covers three-fourths of the state, and five-eighths of it are wild, unoccupied land, the remainder being only rudely utilized by the inhabitants. The climate is tropical and unhealthful. The products are tropical. Along the route of the canal to be built by the United States a zone 10 miles wide has been placed under the authority of the United States, excepting the cities of Panama and Colon, so that the United States may carry out works of sanitation and have full power to facilitate the building and protection of the canal. Panama and Colon are the only important ports. The people represent an admixture of Spanish, negro and Indian blood. Their trade is small, the great traffic crossing the isthmus being almost altogether transit trade. Foreign trade (fiscal year 1910–1911)—imports, $10,020,070; exports, $1,754,050.

Paraguay.—A republic of South America. Area, 97,726 square miles; population (1912), 800,000. Between 22°–28° south latitude and 55°–62° west longitude. Capital, Asuncion, population, 80,000; Villarrica, 28,755; Carapegua, 15,000; Villa Pilar, 7,247. One of the smallest states of South America; it does not touch the sea, but the Parana and Paraguay rivers, accessible to large steamers, give it an outlet to the Atlantic. It is mountainous in the east, has a sub-tropical climate, agreeable and healthful, and receives abundant rainfall. Most of the country is well adapted for foreign colonization. The western part, bordered by the Pilcomayo River, is a low, warm plain, interspersed with forests and especially adapted for cattle raising. The eastern and more populous region is mainly covered with dense forests, with great but undeveloped wealth in timber, interspersed with plains, especially towards the south, which are splendidly adapted for cattle and farming. The vast resources of all kinds are still little developed. Rice, sugar-cane, maize and the potato are the chief farm

crops, but the great product is maté, which is gathered wild in the woods, and is exported to the amount of about 15,000,000 pounds a year. It is sold chiefly to the country people in several South American states, and is regarded as an excellent substitute for tea and coffee. Domestic animals are chiefly confined to cattle (about 1,000,000), raised mostly for local consumption. Iron, kaolin and salt are abundant but little developed. A few home industries supply most of the demand except for textiles and hardware. A railroad (150 miles) connects Asuncion with the Uruguay system. Races —Spanish-American, 100,000 Indians, and a few thousand Brazilians and Europeans. Religion, Roman Catholic. Foreign trade (1911)—imports, $6,478,495; exports, $4,828,910.

Persia.—A constitutional monarchy of southwest Asia. Area, 628,000 square miles; population, about 8,000,000. Between 25°–39° north latitude and 44°–62° east longitude. Capital, Teheran, population, 280,000; Tabriz, 200,000; Ispahan, 70,000; Meshed, 60,000; Kerman, 60,000. A high tableland, more than a third of it sandy desert and salt plain, mountainous in the west and north, tillage confined mainly to the west in irrigated valleys. The rainfall is largely deficient; climate healthful, but very warm in the south. The Persian monarch assumes the title of Shah-in-shah, or King of Kings. The administration is corrupt, but the adoption of European innovations in the army, etc., gives an air of progress. The real wealth is arborescent culture, particularly fruits. Cotton cultivation has made considerable progress and the fiber is now the principal export. All kinds of minerals are found, but they will not be available until the wretched communications are improved and mining regions are open to foreigners. Most turquoises, however, come from Persia. The Russian influence now predominates in northern Persia to counterbalance

the English influence in the southern section. House industries supply most of the local demand, and the Persians are famous for carpets and rugs, which are the largest manufactured export. Race, Persian. Religions, chiefly Mohammedan (Shiite sect) 65,000 Christians, 19,000 Jews. The import is larger than the export trade, textiles, glass, sugar, kerosene and tea and coffee being large purchases. Opium, cotton and wool, silk, carpets, pearls and turquoises are the chief exports. Foreign trade (1911) —imports, $57,020,845; exports, $42,058,470.

Peru.—A South American republic. Area, 690,000 square miles; population (1912), 4,500,000. On the Pacific Ocean, between 3° and 18° south latitude and 70° and 81° west longitude. Capital, Lima, population, 145,000; Callao, 48,118. Arequipa, 35,000; Cuzco, 30,000. It has a long littoral on the ocean, and a part of its territory extends to the east of the Andes, giving access to the Atlantic by the Amazon River. The plain between the Andes ranges and the Pacific is a desert, with ribbons of verdure along the streams, bordered by irrigated plantations where sugar-cane, cotton and tobacco are raised. The mountain ranges are economically important for their vast stores of minerals and the rivers that their melting snows send to the sea. The forests east of the mountains are rich in rubber and cinchona (quinine), and have splendid prospects for tropical agriculture, as yet little developed. The climate is tropical. Agriculture is limited to the production of food consumed at home, though the plantations supply some export cotton, rice and coca (from which cocaine is derived), and also sugar-cane for the home refineries. Cattle are numerous among the foothills of the Andes. The alpaca supplies much wool, and the llama is used chiefly for mountain transportation. Sugar and metals (silver, copper, quicksilver) are the principal exports, sugar being the most important. Mining is restricted by the necessity

of carrying ore on the backs of llamas or mules to the railroads, several of which start from the ports to the interior, but have not yet reached all the important mining districts. Guano, once a great export, is practically exhausted. Manufactures are confined to sugar refineries, tanneries, breweries and a few cotton mills. Callao is the chief port. The largest imports are textiles, iron and steel goods, machinery and groceries. Races, Spanish-American and Indian. Religion, Roman Catholic. Foreign trade (1911)—imports, $30,964,965; exports, $36,071,056.

Philippine Islands.—A large island group in the Malay Archipelago, under the control of the United States. Area, about 120,000 square miles; population, 7,635,000. Between 5°–20° north latitude and 117°–127° east longitude. Comprises about 3,141 large and small islands, of which about 400 are inhabited. The largest islands are Mindanao, Luzon (commercially the most important), Panay, Palawan, Mindoro, Negros, Samar, Leyte and Cebu. Mountains are the chief topographic feature. The larger islands, especially Luzon and Mindanao, have broad, well-watered plains which are tillable but not over a third of the area is adapted for cultivation. The climate is tropical, the night breezes from the sea affording some relief, but the islands are not healthful for the white races. The population is densest in Luzon and the Visayas, or central islands. Rice is the chief production, but in poor years much is imported from Cochin-China, as this grain is the chief food. Manila hemp, a strong, coarse fiber derived from a species of the banana, is the best material for cordage and sailcloth and is a large export, the Philippines being as yet the chief source of supply. About 172,500 tons of hemp are exported annually. Tobacco is also a great crop, the best growing in northern Luzon. It is sent in large quantities to other parts of Asia and some of

the western lands. Sugar, copra and cocoanuts are also export articles. Rubber is grown on a small scale. The mineral wealth is large but undeveloped. The United States has established local self-government wherever practicable, is efficiently protecting life and property, and is developing the islands by establishing agricultural experiment stations, live stock and schools. Railways are being built gradually. The total length of railways built up to the end of 1912 was 1,051 kilometers. The government has surveyed the coasts in the interests of fishing, and in many other ways is doing much to facilitate progress. The Tagals of Luzon and the Visayas are more advanced in civilization than the other natives, who include the dwarf Negritos and the Mohammedan Moros. Races—Malayan, Negroid, Chinese and whites. Over 3,000,000 profess Christianity (Roman Catholic). Imports are chiefly cotton goods, hardware and machinery. The imports in 1912 were $64,237,395; exports, $57,067,435.

Portugal.—A republic in Europe. Area (with Azores and Madeira), 5,049,729 square mlles; population (1911), 5,957,985. Between 37°–42° north latitude and 6°–10° west longitude. Capital, Lisbon, population 356,009; Oporto, 172,000; Braga, 24,202; Funchal, 18,989. Most of the country is mountainous, being occupied by the western slopes of the Spanish ranges. The plains, very fertile, are almost wholly confined to the west coast and along the rivers. The climate is oceanic, and high degrees of temperature are registered only in the south. Rainfall is considerable, especially in winter and spring. The rivers Tagos, Douro, Guadiana and Minho are generally navigable to the Spanish frontier. Flax and southern fruits are large crops, but wine growing (conspicuously port wine) is the most noted branch of husbandry. In the quality of its wine, Portugal is one of the leading wine countries. The chief domestic animals

are cattle, mules, asses and swine, and the fisheries along the coast are very productive. Cork derived from the bark of a species of oak is sent to all civilized lands. The country is highly metalliferous, but the mining industry is backward and the mines that are worked are chiefly in the hands of foreigners. Sea salt obtained by evaporation is a large product. The manufactures do not meet the home demand either in quality or quantity, though textiles, hats, leather, porcelain, ornaments, etc., are produced in Lisbon, Oporto, Braga and some other towns. Railroads connect all the chief centers of population, and domestic trade is much facilitated by rivers. Much produce is brought in from the colonies, the other leading imports being grain, cotton, coal, timber and English and French manufactures. The chief exports are wine, cork, sea salt, copper and fish. Race, Portuguese. Religion, Roman Catholic. Foreign trade (1912)—imports, $77,715,000; exports, $38,572,000.

Porto Rico—Colony of the United States in the West Indies. The island is 95 miles long and 35 miles broad, with an area of 3,668 square miles. Between 17°–19° north latitude and 65°–67° west longitude. Population (1910), 1,118,012. Capital, San Juan, population, 48,716. Ponce, on the southern coast, second largest port, population, 35,027. The central range of mountains extends nearly the entire length of the island, condensing the moist trade winds, so that the northern half of the island has abundant rainfall, while the fields of the southern half often require irrigation. The little rivers of the north for this reason contain more water than the southern rivers, and many small boats carry farm produce to the northern coast towns. Alluvial plains skirt the coast, but most of the island is volcanic mountains and foothills of limestone. The tropical climate is tempered by the trade winds. The island is liable, in the late summer and autumn, to be visited by severe hurricanes

which sometimes do great damage. Most of the farms are small, and four-fifths of the population are engaged in agriculture. The staple products are coffee, sugar and tobacco. The coffee shrubs, grown in the shade of banana and guava trees, do best high up on the hills. The quality of the bean is excellent, and the product meets with ready sale. Over 150,000 acres are in coffee, and 80,000 acres in sugar. Sugar-cane is planted chiefly on the alluvial coastal plains. The finest tobacco districts (about 12,000,000 pounds annually) are in the inland mountain regions. The mineral resources are not large, but the evaporation of brine supplies the island with about 10,000,000 pounds of salt a year; and magnetite, gold and copper ore are found to some extent. Gypsum is very useful in making stucco, and there is an abundance of building stone. Most roads are very poor, but the United States has connected some important towns with good roads. San Juan and Ponce are connected by an excellent macadam road, and sections of a coast railroad that is to extend around the island are in operation. Steamers ply around the island as well as to the United States, Europe and neighboring islands. Races, 589,426 whites, 363,742 negroes and mixed breeds. Religion, chiefly Roman Catholic. Nearly all the trade is with the United States. In the fiscal year ending June 30, 1912, the island sold to this country goods worth $42,873,401, and purchased from us commodities valued at $37,424,545. Foreign trade in the same period: Imports, $4,501,928; exports, $6,832,012.

Rumania.—A limited monarchy of eastern Europe. Area, 51,098 square miles; population (1912), 7,248,061. Between 43°–48° north latitude and 23°–30° east longitude. Capital, Bucharest; population, 388,109; Jassy, 78,611; Galatz, 71,719. Most of the country is a well-watered plain, with skirts of the Carpathians only in the west and north. The Danube is the

chief river, navigable throughout, but of its tributaries only the Pruth is navigable for steamers and the Sereth for rafts. The climate is continental because the country is open to the northeast. Seventy-five per cent. of the people are farmers, but primitive methods still prevail. The soil is very fertile, and all products of the temperate zone, and even rice, are raised. The chief crops are maize (the staple food), wheat, barley, oats, rye, tobacco and wine, all produced in excess of the demand. More maize is raised than in any other country of Europe. Domestic animals are raised in large numbers. The mineral wealth is great, but only petroleum and salt are worked extensively. Petroleum by-products are used for fuel on railroads, steamboats, and in factories. Manufactures are primitive, and all the finer products must be imported. Flour mills, distilleries and tobacco works are the chief industries. Foreign capitalists own all important manufacturing enterprises, so that the Rumanians derive little profit from them. Races—Rumanians, 400,000 Jews, 200,000 Gypsies, 85,000 Slavs, 40,000 Germans, 30,000 Hungarians, 8,000 Armenians. Religions—Greek Orthodox, Roman Catholic, Protestant, Israelite and Mohammedan. Grain is three-fourths of the exports, and imports are mainly textiles and iron goods. Foreign trade (1910)—imports, $65,554,560; exports, $110,586,240.

Russian Empire.—An absolute monarchy. Area, Russia in Europe (with Finland and Poland), 2,095,616 square miles; Caucasia, 180,843; Central Asia, 1,548,825; Siberia, 4,833,496; total empire, 8,660,395. Population, European Russia, 106,225,138; total population empire, 138,930,319. Between 36° and 76° latitude and 19° and 170° east longitude. Capital, St. Petersburg; population, 1,907,000; Moscow, 1,618,000; Warsaw, 848,000; Odessa, 540,000; Helsingfors, 144,000;

mountainous, save for wide steppes north of the Caucasus range and fertile valleys and a part of the Armenian table-land in the south. The climate south of the mountains is cooler than north of them. Caucasia is rich in timber and farm products, especially wine, but domestic animals are more important than agriculture. The mineral wealth is great, but petroleum is the most valuable. The wells near Baku supply Russia and a good part of Asia with petroleum, which also sells freely in western Europe. A large production of manganese is obtained in the western section of Caucasia. The native manufactures barely meet home demands, but Tiflis and Erivan are distinguished for carpets, embroideries and weapons. The trade statistics are included in Russia's commerce. No trade statistics are issued for the rest of Russian Asia.

The River Yenisei divides Siberia into a western and level half and an eastern and more mountainous half. Siberia has long, hard winters and short, hot summers. The Obi, Irtish, Yenisei, Lena and Amur rivers are important means of transportation, and many vessels ply on Lake Baikal. The western half of Siberia is more fertile and thickly populated, and is chiefly devoted to agriculture, the ordinary grains, potatoes, onions, melons, etc., thriving in southwestern Siberia. The same region contains millions of sheep and cattle. The mineral wealth is considerably developed and widely distributed, gold, silver and graphite being most worked. The enormous coal-field in central Siberia and the extensive deposits of iron, lead and copper are still almost untouched. Manufacturing is chiefly confined to tanning, brick-making, ore smelting, etc. The trans-Siberian railroad and the rivers supply large transportation facilities, and all the principal towns are connected by post routes. The principal commercial centers are Tomsk, Irkutsk, Yakutsk and Kiakta.

Russian Central Asia includes the Kirghiz steppes and Turkestan, the latter being of most economic importance. The commercial center of Turkestan is the flourishing city of Tashkent. Cotton is the largest export, and the Russian government endeavors to develop the cultivation of this crop to the largest extent. Over 800,000,000 pounds of clean fiber are sent annually to the Russian mills. Silk is also produced. Russian Central Asia has exterior trade relations only with Russia, Siberia and Persia, Indian and Afghan merchants also bringing some British commodities into the markets. The trans-Caspian and the Orenburg railroads are greatly stimulating the economic growth of these possessions.

Salvador.—A republic of Central America. Area, 7,225 square miles; population, 1,707,000. Between 13° and 14° north latitude and 87° and 89° west longitude. The smallest of American countries, with a more dense population than any other Central American state. Capital, San Salvador; population, 59,544. Salvador extends along the Pacific coast with a sea frontage of 170 miles. The state is noted for its coffee, of which it has the largest export, except Guatemala. There are hundreds of sugar plantations. Indigo constitutes 13 per cent. of its exports. Live stock does not fill the demand for domestic animals, and mining is unimportant. Most exports are shipped through La Libertad and Acajutla. Flour, textiles and hardware are the chief imports, half of which come from England. Races—Spanish-American, Indians and mixed bloods. Foreign trade (1911)—imports, $5,390,370; exports, $8,406,309.

San Marino.—An independent state in Italy. Area, about 24 square miles; population, 11,000. Situated about 44° north latitude and 12° 25′ east longitude. Capital, San Marino. This old and famous city stands on the summit of Monte Titano, about 20 miles in an air line from the Adriatic. San Marino

has existed as a sovereign state from the fourth century A.D., but, though independent, it accepts a subsidy from Italy and claims the special protection of the king. The republic, however, is not democratic, as the citizens have no vote. The supreme power is vested in a council of 60 members, the title of Councilor being hereditary in the family, and when a family becomes extinct the council elects another councilor. Race, Italian. No trade statistics.

Santo Domingo.—Negro republic occupying the east end of Haiti. Area, 18,045 square miles; population, 600,000. Between 17°–20° north latitude and 68°–72° west longitude. Capital, Santo Domingo; population, about 22,000; Puerto Plata, the most important port, 6,000. The country is mountainous and inland communications are poor. Mineral wealth of the country supposed to be large. Cattle raising has recently been introduced. The leading industries and exports are sugar, tobacco, mahogany, cacao and divi-divi, valued for its pods, containing tannin and gallic acid, used to tan leather and dye cloth. The U. S. buys nearly all the exports and supplies about half the manufactures purchased. Race, Spanish-speaking negroes. Trade (1912)—imports, $5,191,023; exports, $4,480,827.

Servia.—A limited monarchy of south Europe. Area, 19,050 square miles; population (1910), 2,922,068. Between 43°–45° north latitude and 19°–23° east longitude. Capital, Belgrade; population, 90,890; Nish, 29,949. The country is covered with mountains. The chief rivers are the Danube, Save and Morava. The climate is continental (very cold in winter and warm in summer). The soil is fertile and the mountains are covered with forests of oak and other trees. Nine-tenths of the people are farmers, and Servia produces more maize, wheat, barley, rye and oats than it needs. Domestic

animals are in large numbers, and live stock, especially hogs, are exported. The country is rich in minerals, but defective means of communication retard development. Manufactures, in spite of high protective duties, have attained no high level, and all fine articles are imported, while the house industries supply most needs of the peasantry. Servia has 400 miles of railroads, and its chief rivers also promote domestic trade. Most of the foreign trade is with Austria-Hungary, with which Servia is connected by natural trade routes. The railroad from Paris to Constantinople and Salonica passes through the country, giving Servia two outlets to the Mediterranean. The chief exports are grain and live stock, and the imports are manufactured goods and petroleum. Over six-sevenths of the people are Servians. Religions—Roman Catholic, Israelite and Mohammedan. Foreign trade (1911)—imports, $22,277,105; exports, $22,564,855.

Siam.—An absolute monarchy of South Asia. Area, 200,000 square miles; population (1910), 8,117,953. Between 12°–21° north latitude and 97°–106° east longitude (also includes the narrow strip of the Malay peninsula to 4° north latitude). Capital, Bangkok; population, 628,000; Chantabun, 30,000. Chiefly plains with mountains in the northwest, climate tropical. The larger part of the people live in the wonderfully fertile valley of the Menam, upon whose rise every year the quantity of the rice crop depends. Thus the river bears much the same relation to Siam that the Nile does to Egypt. Siam is one of the great rice-producing countries, the exports being surpassed only by those of Burma and Cochin-China. While the southern part is a flat delta land producing little but rice, the great forests of the northern mountain regions contain teak and other timbers. Teak is floated down the Menam to Bangkok, and this valuable timber, and rice, are the two great

export commodities. Most of the commerce is in the hands of Chinese merchants. Bangkok has steamship connections with Europe, but the larger vessels cannot cross the bar at the mouth of the Menam, and much freight is therefore lightered between the ships and the capital, 25 miles up the river. The king and his government are progressive; considerable machinery is being introduced and the country is increasing in prosperity. Over 600 miles are operated in the country. Races—2,000,000 Siamese, 2,000,000 Chinese, 1,000,000 Malay, 500,000 Laos. Religion, chiefly Buddhist. Trade (1911–12)—imports, $27,712,-815; exports, $32,068,205.

Spain.—A limited monarchy in Europe. Area, 197,670 square miles; population (1910), 19,537,434. Between 36° and 44° north latitude and 10° west to 4° east longitude. Capital, Madrid; population, 597,973; Barcelona, 587,219; Valencia, 233,348; Seville, 155,366. The Spanish peninsula is a high plateau, largely covered by mountains. The center of Spain is occupied by the two extensive table-lands of Old Castille and New Castille, dry and unfertile and better suited for cattle raising than for tillage. Spain also contains two great lowland valleys or plains, the Aragonese plain, in the north, and the Andalusian plain, in the south, which, like the level coast districts, are among the most fertile lands of Europe. But they are small in extent compared with the table-lands. The rivers are deficient in water most of the year and of little value either for shipping or agriculture. Many canals were built centuries ago, chiefly to irrigate arid districts, but they were permitted to fall into ruin. The government is now repairing the canals and building new ones to serve both irrigation and navigation. The climatic conditions of most of South Europe are found only in the coast districts and Andalusia. The bare interior, owing to its high elevation, suffers from winter and summer extremes

of temperature, and with the sea on three sides, Spain is deficient in rainfall and much irrigation is necessary.

About seven-eighths of the people are farmers, few of whom practise advanced methods of tillage. The best watered and cultivated province is Valencia, and several other provinces are carefully tilled. Apples, pears and southern fruits thrive; in good years the northern provinces export cereals and the southern provinces maize and rice. Olive oil is a very large product, and the vine is the most important branch of Spanish husbandry. Most Spanish wines are inferior, but the warm climate of the south produces the famous wines of Malaga, Alicante and Jerez (sherry). The finest pastures are near the Atlantic, in the northwest, but over 16,000,000 sheep graze on the central table-land and are driven down to lower districts in winter. Spain is very rich in coal, iron, copper, lead and quick-silver, but most of the mining is done by foreign capitalists and the ore is sometimes exported raw. Mining products attain $32,500,000 annually. The northeast province of Catalonia (especially the Barcelona district) is the home of the greater part of Spanish manufactures. The cotton and metal industries are most prominent there, and cotton, flour and olive oil are the leading manufactures. Minor industries are limited by the poverty of the people, who have small purchasing power. The trade of Spain consists mainly of the export of raw produce and the import of most of the manufactures consumed. Barcelona is the chief port as well as the leading mercantile city, and Valencia, Alicante, Malaga, Cadiz, Santander and Bilbao are also important ports. Races, chiefly Spanish. Religion, Roman Catholic. Foreign trade (1911 estimated)—imports, $190,561,000; exports, $170,291,000.

Sweden.—Until September, 1905, the eastern part of the kingdom of Sweden and Norway, when Norway seceded from

this union and became an independent state. Area, 172,876 square miles; population (1910), 5,521,943. Between 55° and 70° north latitude and 12° and 24° east longitude. Capital, Stockholm, population, 341,986; Göteborg, 167,813; Malmö, 88,158. Sweden is mountainous, especially in the west, but much flatter than Norway. The only plain of any size belongs to Sweden; it extends along the east coast to the south of the peninsula, and includes the fertile region of Gothland, the best agricultural part of Sweden. The climate is colder than that of Norway, and though half of the land is unproductive, three-fourths of the people are farmers. Sweden produces more cereals than Norway, and exports grain, chiefly oats, though it imports rye and rye meal and also wheat flour. Much live stock is exported. The government has done a great deal for the intelligent development of dairy farming and the general improvement of agriculture. The fisheries are far inferior to those of Norway, and do not even supply the home demand. The timber trade, on the other hand, is of great importance, constituting, as it does, 50 per cent. of the export trade. The shipments are made largely to England and France. Sweden is poorly supplied with coal, but has large deposits of iron ore north of the Arctic Circle. A railroad has been built from the mines to the Atlantic to carry the ore to England and Germany. Sweden is industrially dependent on other countries, as coal, population and capital are wanting. The best-developed manufactures are the iron and wood industries; Swedish matches are everywhere famous. Linen manufactures meet the domestic demand, but the woolen and cotton factories supply only a part of the home need. Stockholm and Göteborg are the chief ports, and there is a large coastal trade and adequate connections with foreign countries. South Sweden has a fine canal system, and railroads connect the chief towns with one another

and with Norway. Races, Swedish and 229,000 foreigners. Religions—1,716,548 Protestants, 183,828 Catholics, 8,069 Israelites. Foreign trade (1910)—imports, $179,998,000; exports, $158,888,000.

Switzerland.—A European republic. Area, 15,976 square miles; population (1910), 3,753,293. Between 45° and 48° north latitude and 6° and 11° east longitude. Capital, Berne, population, 85,651; Zürich, 190,733; Basel, 132,276; Geneva, 123,154. Three-fourths of Switzerland are covered with mountains, and most of the inhabitants live on an undulating plain between the Jura Mountains, in the north, and the Alps, in the south. Several passes afford wagon roads over the mountains to Austria and Italy; and three tunnels, the Arlberg (to Austria), the St. Gotthard and Simplon (to Italy), give uninterrupted connections across Switzerland with the regions north and south. Owing to the Alps, the republic is well supplied with water, and while the streams are useless for navigation, they give abundant power for industrial purposes. The lakes furnish important navigation. Scenery is one of the great resources of Switzerland and attracts over 1,000,000 foreigners a year. The climate of the valleys is temperate and the rainfall is very large.

The mountainous character of the country gives agriculture a subordinate place, and only four cantons produce enough food for the home demand. The importation of grain, live stock (for meat) and potatoes is therefore very large. The vine is largely cultivated, but the wine product does not meet the demand. The meadow and mountain pastures have developed stock farming to a considerable extent, and the dairy products are famous, three-fifths of the cheese being exported to all parts of the world. Minerals are of little importance, and as there is no coal, the manufacturing industries would be at a great

disadvantage if it were not for the water power. As it is, this natural and abundant supply of power, together with the intelligence of the working classes, has made Switzerland one of the chief manufacturing countries of the world.

Over 500,000 persons are engaged in the production of cottons, silk, watches, jewelry, machinery, wooden and straw goods and other wares. The products are chiefly those that are distinguished for high quality of workmanship, and Swiss manufactures find markets among all the leading nations. Though Switzerland is far from the sea, the railroads to northern and southern ports serve her commercial relations. Races—two-thirds German, one-fifth French, Italian and immigrants from other parts of Europe. Religions—1,716,548 Protestants, 1,183,828 Roman Catholics, 8,069 Israelites. Trade (1911)—imports, $347,855,000; exports, $242,661,000.

Transvaal Colony.—Formerly the South African republic, but made a colony by Great Britain as a result of the British-Boer war. Now a part of the Union of South Africa. Area, 119,139 square miles; population, 1,676,611, of whom 290,000 are whites (200,000 Boers). Between 22°–28° south latitude and 24°–32° east longitude. Capital, Pretoria, population, 37,000; Johannesburg, 159,000. The colony is on the high interior plateau of South Africa, 4,000 to 6,000 feet above the sea. The mountains are chiefly in the east, south and north, with a wide spread plain in the interior and smaller plains scattered through the country. The plateau is higher in the south than in the north, and the climate, temperate in the south and center, is tropical in the north. No rivers are available for navigation. The plains are the home of most of the Boers, who tend their live stock, chiefly cattle, on large farms; vegetable gardens and cattle raising for beef are developed chiefly in the south to supply the wants of the large towns.

In 1904 the largest diamond ever discovered was found in a

mine opened in 1903 near Johannesburg. Gold, however, is the greatest mineral resource, and the mines are scattered through the eastern and southern parts of the colony. The region that dwarfs them all is the Witwatersrand (The Rand), on which Johannesburg stands. It is a rise of ground, the water parting between two drainage areas, about a mile and a half wide and 125 miles long. On about 30 miles of this narrow strip $80,000,000 of gold were mined the year before the war, surpassing the yield of any other country. The industry was at a standstill during the war, but has rapidly revived, about $72,000,000 of gold are mined annually. Gold is practically the only export. Railroads extend to Johannesburg from Cape Colony, Natal and Portuguese East Africa. Races—Boers, other whites, chiefly British, native blacks and Chinese laborers in the mines.

Turkey.—Despotic monarchy of southeast Europe. Area, about 5,000 square miles since the Balkan war; area empire, 1,053,997 square miles (not including Egypt). Population (Turkey in Europe), 2,000,000 since Balkan War. Population empire, about 30,000,000. Capital, Constantinople, population, 1,106,000; Salonica, 174,000; Adrianople, 125,000. Turkey in Europe is mountainous, as is the rest of the Balkan peninsula, with many valleys but no large plains. The Maritza and other plains of no great extent are extremely fertile. The climate is extreme in the interior. Turkey's resources might make her one of the richest countries in Europe, but she is one of the poorest. This is due to oppressive taxation, which consumes one-third of the harvests, wretched government, few roads and a degraded standard of civilization.

The soil, however, in spite of bad tillage, produces more than the country consumes. Maize, wheat, wine of poor quality, tobacco and fruits are the chief crops. Stock farming more than meets the home demand, though little is done to improve

domestic animals. The country is very rich in ores, but there is practically no mining. Constantinople and Salonica have a few silk factories and steam mills, but there is little industry outside the household manufactures. Turkey is therefore an important market for Western manufactures, paying for them with natural productions. Races—70 per cent. Turks, Greeks, Albanians, etc. Religions—50 per cent. Mohammedan, 42 per cent. Greek Orthodox, 5 per cent. Roman Catholics. Foreign trade (1911)—imports, $169,987,108; exports, $101,236,681.

Railroads in Asiatic Turkey are increasing the importance of Turkey in Asia. The German lines, including the Bagdad Railroad, extend from Constantinople to Aleppo. The most important city of Asia Minor is Smyrna, second only to Constantinople in the Levant. Asia Minor is famous for Smyrna rugs and carpets, and the hair (mohair) of the Angora goat. Syria sends wheat and wool abroad, chiefly through the port of Beirut, which is connected with Damascus by rail. Another railroad extends from Jaffa to Jerusalem. The railroad from Damascus to Mecca, the great goal of the Mohammedan pilgrims, has now attained Medina. Mesopotamia has steam communication with India and England through Basra, at the head of the Persian Gulf. Cereals and dates are exported, dates going to all civilized lands. The land transport of Mesopotamia is by mule or camel. The district of Yemen, on the Red Sea, is a fertile Arabian coast-land producing Mocha coffee.

Tutuila.—A small island in the eastern part of the Samoan Archipelago. It came into the possession of the United States in 1899. Manua and Rose islands, small bits of land to the east of Tutuila, are included in the colony. Tutuila is of volcanic origin, less than 60 square miles in extent, produces copra for export, and has in Pago-Pago one of the finest landlocked-

harbors in the Pacific. It is a coaling station. The islands have a population of 7,250.

United States of America.—A North American republic. Its territory south of Canada lies between 24°–49° north latitude and 66°–125° west longitude. Its area, exclusive of the Territories of Alaska and Hawaii (which see), is 2,970,230 square miles of land and 55,370 of water; total area, 3,025,600 square miles. The land surface aggregates 1,900,947,200 acres. The total area, including the Territories, but exclusive of the colonial possessions, is 3,622,213 square miles. Population (1910), 91,972,266 (76,303,387 in 1900). Capital, Washington, D. C., population, 331,069; New York, 4,766,883; Chicago, 2,185,283; Philadelphia, 1,549,008; St. Louis, 687,029; Boston, 670,585; Baltimore, 558,485; Cleveland, 560,663; Buffalo, 423,715; San Francisco, 416,912; Pittsburg, 533,905; Cincinnati, 364,463; Milwaukee, 373,857; Detroit, 465,766; New Orleans, 339,075; Newark, 347,469; Jersey City, 267,779; Louisville, 223,928; Minneapolis, 301,408.

The continental part of the republic embraces nearly one-half of North America, has all climates excepting the tropical, and can therefore raise practically all the vegetable products of the temperate and subtropical zones. Having also large mineral resources and enormous development of manufactures, it is practically self-sufficient, actually needing to import very little excepting raw products from tropical lands.

Broadly speaking, the country is a great central plain (Mississippi Valley), bordered on the east by mountains of no great elevation (Appalachians), and on the west by mountains (Rocky Mountains and Pacific coast ranges) and plateaus of high elevation; with narrow eastern and broad southern coastal plains, but no coastal plain on the Pacific; with over 14,000 miles of river navigation, nearly all in the eastern half of the

This map shows the lowlands by light shades and highlands by dark shades.

country, and with inland seas providing the cheapest transportation known, excepting on the oceans. These topographic features have had profound influence in distributing industries and shaping development.

The Atlantic coast is low and has all the prominent types of natural harbors, New York, Boston, Philadelphia, Baltimore, the Chesapeake Bay ports, Savannah and Charleston, and Portland, Me., being most prominent. The Pacific coast is high and rocky, with only four great harbor centers, San Diego Bay, San Francisco Bay, the river port of Portland and scores of harbors or harbor sites in Puget Sound, one of the greatest natural harbors in the world.

The eastern coastal plain, covered with débris eroded from the Appalachians, is a region of fruits, vegetables, cereals, timber and pottery clays, finding markets in the greatest cities of the country to the north; the southern coastal plain is a land of cotton and great lumber industries, the plain extending far up the Mississippi Valley. The Great Valley is the preeminent agricultural zone, with tobacco north of the cotton and sugar-cane zone, the corn belt north of the tobacco area, winter wheat in the corn belt, and a great area of spring wheat north of it.

The semi-arid and arid plains begin to rise midway between two oceans and gradually merge with the mountain plateau. The plains are a vast field of the grazing industry, and irrigation projects now in progress will, it is expected, reclaim for tillage 50,000,000 acres on these plains and the plateaus west of them. The mountains yield most of our minerals, have large grazing resources, and conserve from the melting snows and glaciers the water to be used for irrigation.

On the whole, the country west of the 100th meridian has too little rainfall for profitable farming without irrigation except

The five time belts shown on this map are used to regulate time in the railroad and telegraph business of the country. For example, for railroad and telegraph purposes, it is 6 A.M. at all places within the Central time belt when it is noon at Greenwich.

the coke and limestone for smelting. Transportation by the Great Lakes is so cheap that the United States can compete with Great Britain in iron production, though many British iron mines are on the coal-fields. Only in the Birmingham district of Alabama has the United States yet developed iron mining where coal and limestone are found in the same field. The country is the greatest producer of pig iron and steel (1911, pig iron, 24,027,733 tons; steel, 24,054,309 tons). For many years the United States has usually led the world in gold production ($96,233,528 in 1911); silver production in 1911, $32,615,700; coal (largest output in the world), 550,000,000 tons in 1912; petroleum, 9,258,874,422 gallons in 1911. The country is also among the largest producers of copper, zinc, lead and many other minerals. The total value of the mineral production in 1911 was $1,918,184,384.

For many years the manufactures little more than sufficed for home needs, but in recent years the United States has entered the list of nations seeking foreign markets for its manufactured products. Though the price of labor is high, the invention of many forms of labor-saving machinery and the high intelligence and skill of the working people now enable the United States to compete in many foreign markets with numerous products of the low-priced labor of Europe.

There is a large admixture of races, as immigration from Europe to the United States has been far greater than to any other part of the world. Of the total population in 1910, 6,646,817 were of foreign birth, Germany, Ireland, England and Scotland supplying the largest number. In 1910 there were 81,732,687 whites, 9,828,294 persons of African descent, and 327,348 Indians on reservations. All religious beliefs may be freely held; all sects of Protestants are represented, and Roman Catholics are a large element.

The imports in the fiscal year 1911-1912, were food and live animals, $230,358,230; crude articles for domestic industries, $555,986,041; articles wholly or partly manufactured for further manufacture, $293,739,134; manufactured articles, $360,018,963; miscellaneous and luxuries, etc., $17,061,958; total imports, $1,653,264,934.

Domestic merchandise exported during the same period: Foodstuffs, raw or prepared: $418,737,763; raw material to be used in manufactures: $722,988,839; manufactured articles: $1,020,437,687; miscellaneous: $8,155,539; total exports: $2,170,-319,828.

Union of South Africa.—A self governing union of South African Colonies. The South Africa act of 1909 incorporated Cape Colony, Natal, (including Zululand), Transvaal, and the Orange River Colony (which see) in a single colony known as the Union of South Africa. Its capital is Pretoria, but the seat of legislature is maintained at Cape Town.

Area, 975,500 square miles. Population (1911), 6,000,000, of which over 1,000,000 belong to the white race.

Uruguay.—A republic of South America. Area, 72,110 square miles; population (1910), 1,112,000. Between 30°–35° south latitude and 54°–58° west longitude. Capital, Montevideo; population, 317,879. Uruguay is a wide, grassy plain, intersected by a few low mountain ranges, with temperate climate, abundant rainfall and fertile soil. Its position for trade is very favorable, as the sea forms most of its boundaries, and its rivers, the La Plata and Uruguay, are navigable. The land, mostly in large estates, is devoted to pastoral pursuits and agriculture. Its largest industry is grazing, and most of the cattle are turned into jerked beef, which is exported to several Latin-American countries. The manufacture of meat extracts is also a large business. Millions of sheep thrive, and the exports of wool to Europe

and the United States are usually large. In addition to the vegetable foods consumed at home, wheat and flour are important exports to Europe and Brazil. Flax is raised for linseed, and is also important in the export trade. The chief towns have railroad communications with Montevideo, which is connected by steamship with Europe and the United States. The mineral resources are little utilized, and coal is a large import. Uruguay buys chiefly manufactured articles and sells food products. Races—Spanish-American and about 90,000 foreigners, chiefly Spanish, Italian and Brazilians. Foreign trade (1911)—imports, $47,687,116; exports, $46,318,305.

Venezuela.—A republic of northern South America. Area, 364,000 square miles; population, 2,661,000. Between 1°–13° north latitude and 60°–74° west longitude. Capital, Caracas, population, 73,000; Valencia, 40,000; Maracaibo, 50,000; Barquisimeto, 32,000.

The northern and southern parts of the republic are mountainous. Between them stretch the wide low llanos, covered with grasses and adapted for cattle raising. The Orinoco river is a great inland river, which forms with its tributaries a navigable waterway, 4,000 miles long. The climate is tropical, with dry and rainy seasons, and is oppressively hot on the coasts. The soil is extremely fertile, but little advantage is taken of this source of wealth. Coffee and cacao plantations are of largest importance, machinery has been introduced on them, and the chief exports are these products. Gold is important in the south, and hides, skins and horns are among the exports. Silver and copper are found, but the mining industry is not commensurate with the wealth in these resources. Frequent political revolutions retard the development of this rich land. The foreign trade is chiefly in the hands of foreigners, and flour and various manufactures are the leading imports. Races—Span-

ish-American, Indian and about 40,000 foreign whites. Religion, chiefly Roman Catholic, with a few thousand Protestants and Israelites. Foreign trade (1911)—imports, $18,394,890, exports, $22,684,384.

Zanzibar.—An island sultanate, under British protection, off the tropical coast of East Africa. Area, about 1,000 square miles: population, 210,000. Chief town and port, Zanzibar, in which a large part of the population is centered. Zanzibar is an entrepôt for the collection of commodities destined for shipment from the neighboring islands and coast regions to foreign countries and for the local distribution of foreign imports. Races—chiefly negro, with about 10,000 Arabs and 7,000 Jews. Foreign trade—imports, $5,520,000; exports, $5,850,000.

Partition of the Continents.—Upon our Panama Canal Globe appears, as well as in this classification of countries, dependencies, colonies and islands, a few sections marked as states of apparent importance from their size not mentioned in the foregoing descriptive text. In such cases the land named has no importance or influence in the world's affairs, and is almost entirely undeveloped and occupied by uncivilized natives, with very few civilized people.

The following list shows the Division of the Continents among the various Countries of the World:

NORTH AMERICA

British Honduras.
Canada.
Costa Rica.
Cuba (Continental Island).
Greenland " "
Guatemala.
Haiti and Santo Domingo (Continental Isl.).
Honduras.
Mexico.
Newfoundland (Great Britain).
Nicaragua.
Panama.
Salvador.
United States (with Alaska).

SOUTH AMERICA

Argentine Republic.
Bolivia.
Brazil.
British Guiana.
Chile.
Colombia.
Dutch Guiana.
Ecuador.
French Guiana.
Paraguay.
Peru.
Uruguay.
Venezuela.

EUROPE.

Andorra.
Austria-Hungary (with Bosnia-Herzegovina).
Belgium.
Bulgaria and Eastern Rumelia.
Denmark.
France.
German Empire.
Greece.
Italy (with Sicily and Sardinia).
Liechtenstein.
Luxemburg.
Monaco.
Montenegro.
Netherlands.
Norway.
Portugal.
Rumania.
Russia.
Servia.
Spain.
Sweden.
Switzerland.
Turkey in Europe.
United Kingdom (with islands in British waters).

ASIA.

Afghanistan.
Arabia.
Asiatic Turkey.
Baluchistan.
Bhotan.
Bokhara and Khiva.
Chinese Empire.
Corea (Japanese).
Hong Kong (British).
India (British).
Indo-China (French).
Japan (with Port Arthur).
Nepal.
Persia.
Russia in Asia, Siberia, etc.
Siam.
Straits Settlements (British).
Sumatra.

AFRICA.

Abyssinia.
Abyssinian Somaliland.
Algeria (France).
Anglo-Egyptian Sudan.
Angola (Portuguese).
Ashanti (British).
Basutoland (British).
Bechuana Protectorate (British).
British Central Africa Protectorate.
British East Africa Protectorate.
British Somaliland.
Cameroon (German).
Cape Colony (British).
Congo (Belgian).
Dahomey (French).
Egypt (Turkey).
Eritrea (Italy).
French Congo.
French Guinea.
French Somaliland.
French Sudan.
Gambia (British).
German East Africa.
German Southwest Africa.
Gold Coast (British).
Ivory Coast (British).
Lagos (British).
Liberia.
Libia (Italian).
Morocco. (French).
Natal, with Zululand (British).
Nigeria (British).
Orange River Colony (British).
Portuguese East Africa.
Portuguese Guinea.
Rhodesia (British).
Rio de Oro (Spanish).
Rio Muni (Spanish).
Sahara (mostly to France).
Senegal (France).
Sierra Leone (British).
Somali Coast Protectorate (Italy).
Transvaal Colony (British).
Tunis (France).
Union of South Africa (British).
Uganda Protectorate (British).
Zanzibar Protectorate (British).

Australasia

Commonwealth of Australia

States and Dependencies

NEW SOUTH WALES:
Lord Howe Island.
Norfolk Island.

QUEENSLAND:
Papua.
Dutch New Guinea (Dutch)
Kaiser Wilhelm Land (German)

SOUTH AUSTRALIA
Northern Territory of Australia.

TASMANIA:
Macquarie Islands.

VICTORIA:

WESTERN AUSTRALIA:

Ducie Island.
Ellice Islands.
Fanning Island.
Fiji Islands, with Rotumah.
Gilbert Islands.
Kermadec Islands.
Phoenix Islands.
Pitcairn Island.
Santa Cruz Islands.
Solomon Islands (Guadalcanar, Malaita, etc.).
Tonga Islands.
Union Islands.

WINDWARD ISLANDS:
Barbados.
British Guiana.
Granada.
Santa Lucia.
Sombrero.
St. Vincent.
Tobago.
Trinidad.

Italy.

Aussa and Danakil.
Eritrea.
Libia.
Somali, Coast Protectorate.

Japan.

Corea

Netherlands, The.

DUTCH EAST INDIES:
Amboina.
Atjeh.
Celebes.
Java and Madura.
Lampongs.
Menado (on Celebes Island).
Palembang.
Riau—Lingga Peninsula.
South and East Borneo.
Sumatra East Coast.
Sumatra West Coast.
Ternate.
Timor (west half).
Bali and Lombok.
Banca.
Billiton.
West Borneo.
Western New Guinea.

DUTCH WEST INDIES:
Aruba.
Buen Ayre, or Bonaire.
Curacao.
Saba.
St. Eustatius.
St. Martin (half of which belongs to France).
Surinam, or Dutch Guiana.

Portugal.

AFRICA:
Angola.
Cape Verde Islands.
East Africa (or Portuguese East Africa).
Guinea, Portuguese.
Sao Thoma (St. Thomas) and Principe.

ASIA (PORTUGESE INDIA):
Damao.
Diu.
Goa.
Macao.
Timor (east half), with Cambing (or Pulo Cambing).

Spain.

Annabon.
Fernando Po.
Rio Muni.
Rio de Oro.

United States.

Aleutian Islands.
Baker Island.
Guam.
Hawaiian Islands.
Howland Island.
Marcus Island.
Midway Wake and Johnstone Islands.
Philippine Islands.
Porto Rico,
Tutuila (Samoa).